



Macintosh Computers  
Volume IV

# Service Guide

March 1996

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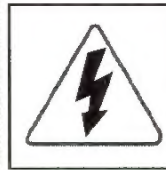




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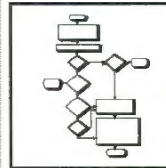
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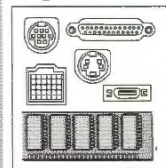
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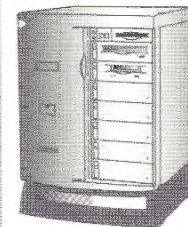
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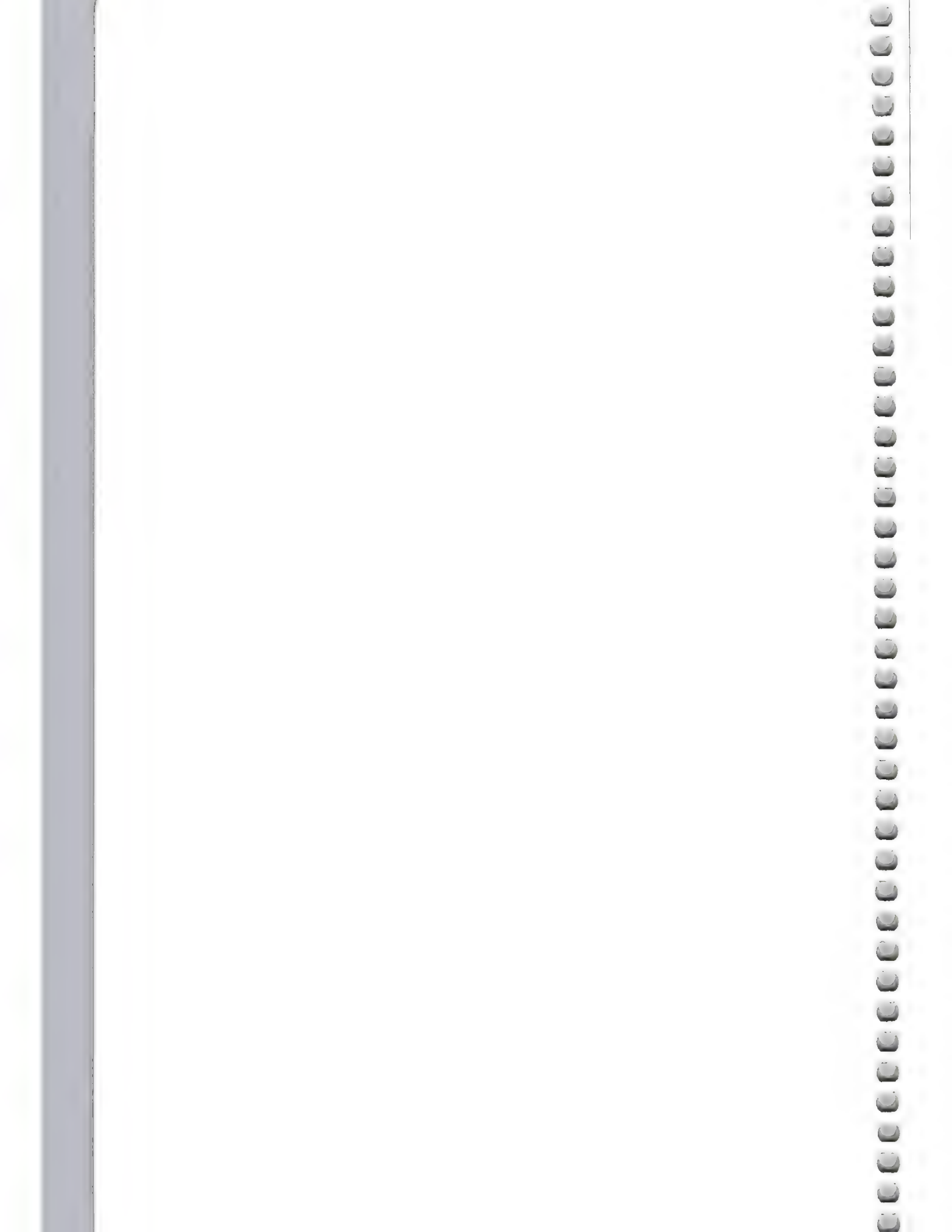
## Introduction

Welcome to *Apple Service Guide for Macintosh Computers, Volume IV*. This volume does not replace Volumes I, II, and III.

- Volume I covers all compact and portable Macintosh computers introduced prior to January 1993.
- Volume II covers all modular Macintosh computers introduced prior to January 1993.
- Volume III covers all compact, portable, and modular Macintosh computers introduced between January 1993 and May 1994.
- Volume IV covers all compact, portable, and modular Macintosh computers introduced between June 1994 and February 1996:
  - Macintosh LC 580 and Performa 580 CD
  - Macintosh LC 630 and 630 DOS Compatible
  - Performa 630 and 640CD DOS Compatible
  - Performa 5200, 5300, 6200 Series, and 6300
  - Power Macintosh 5200/75 LC and 5300/100 LC
  - Power Macintosh 7200, 7500, 8500, and 9500
  - Workgroup Servers 7550 and 8550
  - Apple Network Server 500/700
  - PowerBook 150 and 190
  - PowerBook 5300
  - PowerBook Duo 2300

**Important** When ordering a replacement module or spare part, be sure to check the part number given in this guide against the current Price Pages, which is updated frequently.





# Safety

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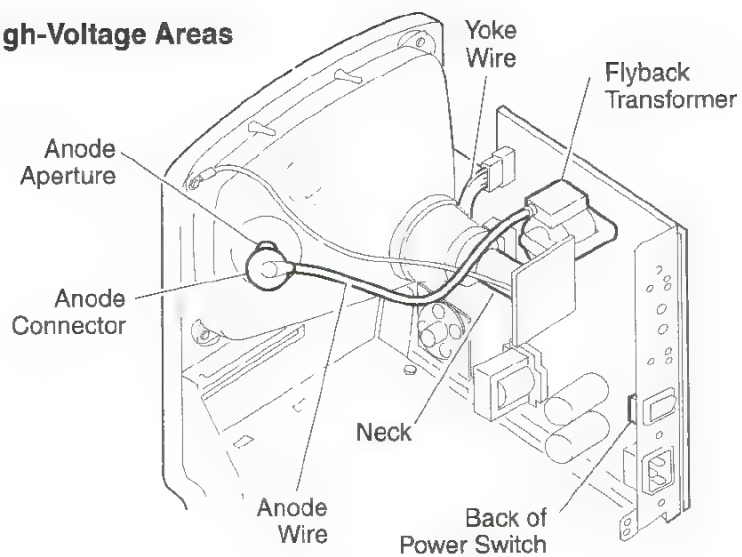
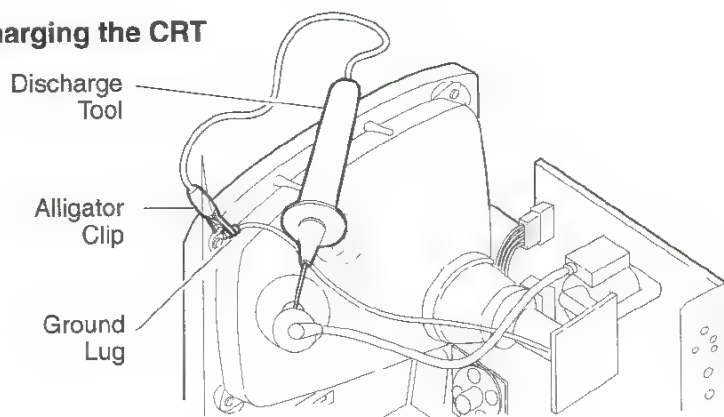
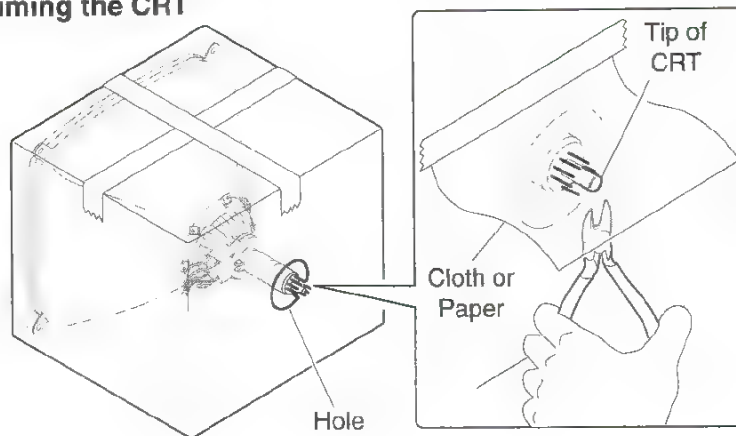
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## CRT Safety

Please follow these 10 rules of CRT safety:

1. Do not work on a monitor alone. In case of an accident, having someone nearby—and having someone trained in CPR—could save your life.
2. Remove all jewelry before performing repairs on a CRT. Removing these conductors reduces the possibility of electric shock.
3. Never use a grounding wriststrap or heelstrap or work on a grounded workbench mat when discharging a monitor or when performing live adjustments. Grounding straps and mats are used to protect sensitive components from ESD damage and should be used only when working on “dead” (uncharged) equipment.
4. Wear safety goggles when working with a CRT. The CRT contains a high vacuum. If cracked or broken, the CRT can implode (collapse into itself). To protect your eyes, always wear safety goggles.
5. Before working inside a monitor, turn off the power and disconnect the AC power cord. Certain parts of a monitor chassis are live (electrified) when the monitor is under power. Never work on a monitor under power except when making live adjustments.
6. When working on a live monitor, keep one hand in your pocket or behind your back. This reduces the risk of current passing through your body, should you accidentally contact high voltage.
7. Always discharge the anode before touching anything inside the monitor. High voltage (up to 12,000 volts DC) can be present on the anode and other components—even when power is off.
8. Never touch the anode connector or the anode aperture. When a CRT is replaced, the anode connector is removed, exposing the anode. The anode can retain a charge of several thousand volts even when power is off and can regain some charge even after being discharged.
9. Do not pick up or handle a CRT by its neck (see Figure 1-A). To prevent an implosion, take every precaution against breaking the tube. Be especially careful with the neck, where the tube is thinnest.
10. Never touch the following components (see Figure 1-A) when adjusting a live Macintosh CRT:
  - Back of the power switch
  - Yoke wires
  - Anode connector
  - Anode wire
  - Flyback transformer



**A CRT High-Voltage Areas****B Discharging the CRT****C Devacuuming the CRT**

**Figure 1. Discharging and Disposing of the CRT**

---

## Discharging and Devacuumping the Cathode-Ray Tube (CRT)

---

### Discharging the CRT

Use this procedure to discharge the high voltage (12,000 volts) from a cathode-ray tube (CRT) in any Macintosh monitor.

**▲ Warning**     **Discharge the anode to the metal ground lug (see Figure 1-B). Failure to do so may damage the logic board.**

---

1. Remove your grounding wriststrap and jewelry, and put on safety goggles.
2. Attach the alligator clip on the CRT discharge tool to the metal part of the ground lug (see Figure 1-B).
3. Put one hand in your pocket or behind your back. With your other hand, insert the tip of the CRT discharge tool under the anode cap until it touches the anode ring.
4. Remove the CRT discharge tool. To be sure the CRT is discharged, repeat the discharge procedure (you may want to repeat the procedure using a flat-blade screwdriver with an insulated handle).

**Note**     The anode can build up voltage over time. To drain off any residual charges, establish an ongoing ground. Fasten one end of an alligator lead to the ground lug and the other end to the anode aperture.

---

### Devacuumping the CRT

To prevent serious injury, always devacuum the CRT before discarding it.

**▲ Warning**     **To properly dispose of a defective CRT, you must first devacuum the cathode-ray tube. Discarded CRTs that have not been devacuumed may crack and implode, injuring anyone nearby.**

---

### Materials Required

- Thick cardboard box large enough to contain the CRT
- Large, sharp diagonal cutters
- Large pliers and duct tape
- Safety goggles and gardening gloves
- 12" x 12" piece of cloth or heavy paper

1. Put on safety goggles.
2. In the side of the box, about six inches from the bottom, cut a hole just large enough to insert the tip of the CRT neck.
3. Place the CRT inside the box with the tip of the neck protruding through the hole, and tape the box flaps down with the duct tape (Figure 1-C).

▲ **Warning**

**Only the very tip of the CRT neck should be protruding through the hole in the box, and the box must not have any other opening.**

4. Put on the gloves and, using the diagonal cutters, carefully clip off the connector pins on the end of the CRT neck.
5. Tape the piece of cloth or paper onto the box so that it forms a veil over the opening, but allows access to the tip of the CRT (see Figure 1-C). The purpose of the veil is to catch bits of glass that may fly during the next step.
6. Make sure no one is standing nearby. Then stand to one side, reach under the veil, and with the large pliers grasp the exposed tip of the CRT. Look away while you snip off the tip of the CRT. You will probably hear a rush of air entering the CRT when the CRT vacuum breaks—but even if you don't, the procedure is complete if the tip of the CRT is clearly broken off.

For directions on how to return defective color cathode-ray tubes (CRTs) see *Service Source* (Path: Programs, Shipping and Returning, Packing and Shipping, CRT Returns).

Electrostatic discharge (ESD) can irreparably damage the sensitive CMOS chips and printed circuitry of modern electronic components. Plastic utensils, polystyrene products, polyester clothing, even the ungrounded touch of your hand carry sufficient electrostatic charges to damage electronic components. Follow the ESD prevention rules and set up an ESD-safe workstation as described on the following pages.



---

## ESD Safety

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### ESD Prevention Rules

1. Before working on a device containing a printed circuit, ground yourself and your equipment. Use a grounded conductive workbench mat and a grounding wriststrap, and ground your equipment to the mat.

#### ▲ Warning

---

**Make sure that you are not grounded when:**

- **You work on plugged-in equipment**
  - **You discharge a cathode-ray tube (CRT)**
  - **You work on an unplugged CRT that has not been discharged**
  - **You perform live adjustments**
- 

2. Do not touch anybody who is working on integrated circuits. You could “zap” the equipment through the technician—even if the technician is grounded.
3. Use static-shielding bags for boards and chips during storage, transportation, and handling. Leave all Apple service exchange components in their ESD-safe packaging until you need them.
4. Handle all ICs by the body, not the leads. Also, do not touch the edge connectors or exposed circuitry on boards or cards.
5. Do not wear polyester clothing or bring plastic, vinyl, or polystyrene into the work environment. The electrostatic field around these nonconductors cannot be removed.
6. Never place components on any metal surface. Use antistatic, conductive, or foam rubber mats.
7. If possible, keep the humidity in the service area between 70% and 90%, and use an ion generator. Charge levels are reduced (but not eliminated) in high-humidity environments and in areas with ion generators.
8. If an ESD pad/workstation is not available, touch bare metal on the power supply to discharge electrostatic charges.

## Setting Up an ESD-Safe Workstation

### Materials Required

- Conductive workbench mat with ground cord
  - Wriststrap with built-in 1-megohm resistor and ground cord
  - Equipment ground cord with alligator clips
  - Ground/polarity tester
- 
1. Remove all ESD hazards from the area. Nonconductive materials (for example, polyester, plastic, vinyl, and polystyrene) cannot be grounded and retain charges for hours and even days.
  2. Use a ground/polarity tester to verify proper grounding of the power outlet. If the outlet is wired incorrectly, most testers show a light pattern that matches a code given on the tester. If the tester does not verify proper grounding, move to another outlet that is safe.
  3. Connect the grounding cord of the workbench mat to ground.
  4. Use a wriststrap grounding cord. Fasten it to the workbench mat and to the wriststrap. The wriststrap must touch your skin.
  5. Finally, ground the equipment you are working on. Use alligator clips and a grounding cord to attach any metal part of the equipment to the grounded workbench mat.

## Handling and Disposing of Batteries

Apple's lithium batteries are sealed in individual zip-locked wrappers. Upon receipt, inspect the integrity of the wrappers, and store the batteries in the same packaging in which they were received.

Lithium thionyl chloride batteries, the type used in most modular Macintosh models, have some potential for explosion if improperly handled.

### ▲ Warning

**Lithium batteries should be stored in a designated, well-marked area with limited access.**

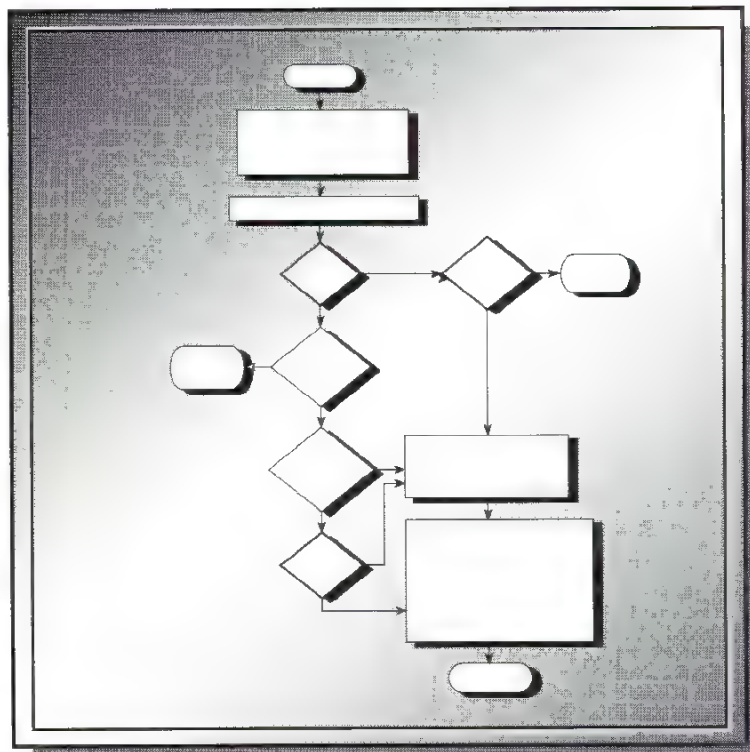
Lithium batteries cannot be recharged and, therefore, require disposal when exhausted. In addition to its explosive potential, lithium is water-reactive and must be disposed of as hazardous waste. Apple recommends the following course of action:

After removing an exhausted battery from the board, clip off the lead wires (necessary for soldered batteries only) and place the battery into the zip-locked wrapper and packaging used for the replacement battery. Mark the battery DEAD and return it to Apple, where it will be disposed of following EPA guidelines. See *Service Source* (Path: Programs, Shipping and Returning, Packing and Shipping, Battery Returns) for complete directions.



# General Troubleshooting

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## Troubleshooting Overview

The entire troubleshooting process could be called “systematic fault isolation,” but in this manual we use the term *troubleshooting* to mean the specific part of the troubleshooting process that occurs if quick fixes and diagnostics cannot solve the problem.

“Systematic fault isolation” means applying your knowledge of the product, its common problems, and the symptoms as you check one possible cause after another, in a logical order. In general, Apple recommends that you check for problems in the following order:

1. User errors—Take nothing for granted. Gather information, duplicate the problem, and try quick fixes. Keep in mind switch or preference settings, incompatible equipment, and incorrect assumptions on the user’s part.
2. Software-related problems—Incompatible or damaged software, viruses, INIT and extension conflicts, duplicate System Folders, and other software problems can cause symptoms that may look like hardware problems. However, replacing hardware won’t solve software problems. Always check for software problems before replacing any hardware. MacTest Pro and MacTest Pro Emergency’s “System Software” tests can detect and repair many software problems.
3. Hardware problems—When you are convinced that the problem is not caused by user error or software, hardware is what’s left. The following are some tips:
  - a. Simplify the problem—Remove external devices and internal cards (except the video card if needed for the display) and test the CPU system by itself. If the problem remains, you have isolated it to the computer itself. If the problem disappears, reinstall the cards and peripherals one by one, until the symptoms reappear. When they do, you have found the culprit—or at least a clue.
  - b. Find the “problem space”—Try to identify the functional area (sometimes called a problem space) that the problem affects. For instance, consider the following functional areas of a typical Macintosh computer:
    - Software
    - Logic and control
    - Memory
    - Video
    - I/O
    - Power

If you can narrow down the problem to, say, the video area, further search the parts that relate to video—the monitor, cables and connectors, video RAM and/or video card (if present), and logic board.

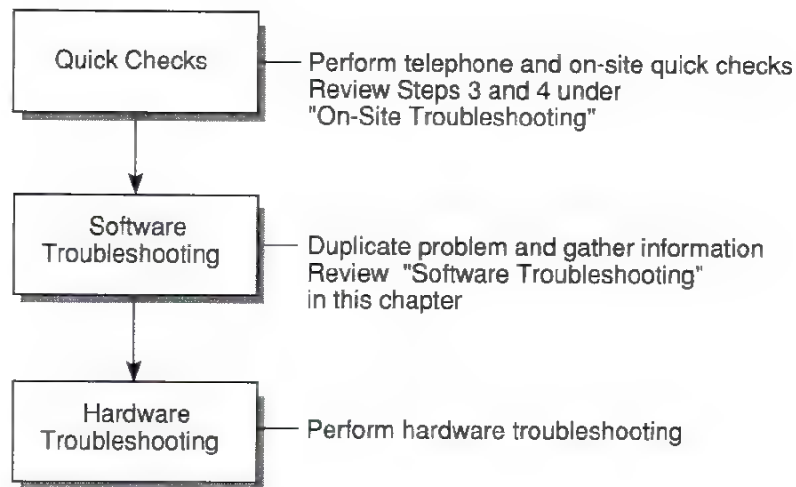
Inspect components, especially mechanical parts and fuses. You may be able to see the cause (a blown fuse, or a visibly damaged chip), or smell it (a burning smell is often a tip-off), or hear it (grinding noises are seldom a good sign). Sometimes you may be able to test specific modules with a voltmeter or ohmmeter. For all Apple computers, and many cards and peripherals as well, you can run diagnostics.

- c. Use symptom/cure charts—When you've isolated the problem to a single device and after you've used the available diagnostics, refer to the symptom/cure chart in each chapter.

These charts direct you to swap suspected modules (such as logic board or power supply) for known-good service stock modules. If the swapped-in module does not fix the problem, reinstall the customer's original module and try the next swap listed. A good practice is to avoid swapping hardware modules as long as possible, since every time you swap a module, you risk damaging the equipment.



## Hardware Troubleshooting



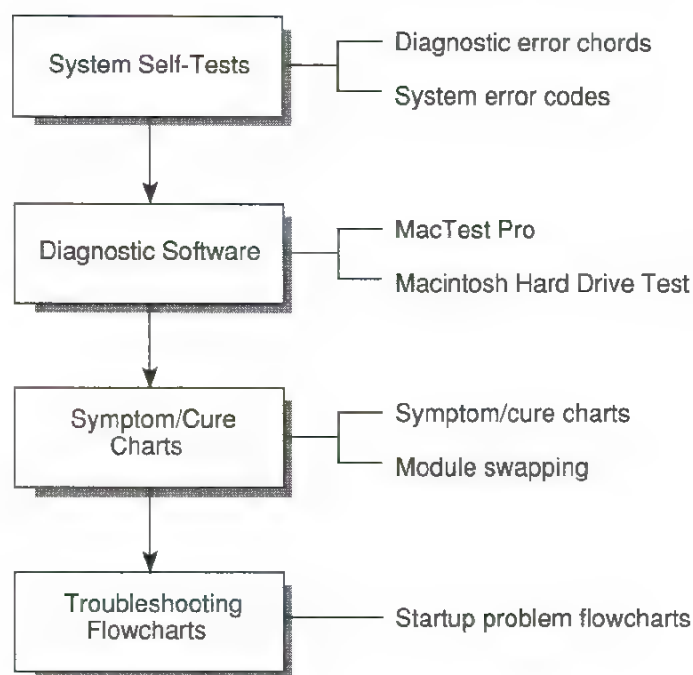
**Figure 2. Troubleshooting: Overall Approach**

### On-Site Troubleshooting

1. Before you travel to a customer's site, review the flowchart in Figure 2 and determine what hardware, software, and tools you may need.
2. Verify the problem by duplicating the symptoms described. If possible, get the customer to show you what is wrong.
3. If there is no power, try hardware quick fixes, such as
  - Checking power source, cable connections, switch settings, compatibilities.
  - Inspecting hardware for damage (spills, blown fuses, and so on).
4. If power is present, try quick fixes (depending on the problem), such as
  - Adjusting user controls.
  - Checking system cables, SCSI IDs, and so on.
  - Clearing the Parameter RAM (PRAM).
  - Trying to boot from MacTest Pro Emergency disk (if not available, use Disk Tools) and running tests. Try this even if a normal boot tone and video are not present.
  - Booting from the hard drive with extensions/INITs **off**.
  - Rebuilding the desktop.
  - Checking software compatibility, reinstalling application software, performing a clean install of system software.

5. Verify the repair. Run MacTest Pro diagnostics (if possible, run overnight in looping mode). For printers and other peripherals, perform functional testing (that is, exercise the machine thoroughly to verify that it functions normally before returning it to the user).
6. Let the user know what you have done and why. To confirm normal system operation, show the user the MacTest Pro test log (if applicable).
7. Complete the administrative tasks. These tasks may vary according to your company's procedures. Apple strongly recommends that you use the AppleOrder system to process any repair transactions, especially those involving exchange modules, warranty reimbursement, AppleCare, or Repair Extension programs. See "CompTIA Module Symptom Codes" in this chapter.

### Isolating a Hardware Problem



**Figure 3. Isolating a Hardware Problem**

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Review the flowchart in Figure 3 and the items below when isolating a hardware problem:

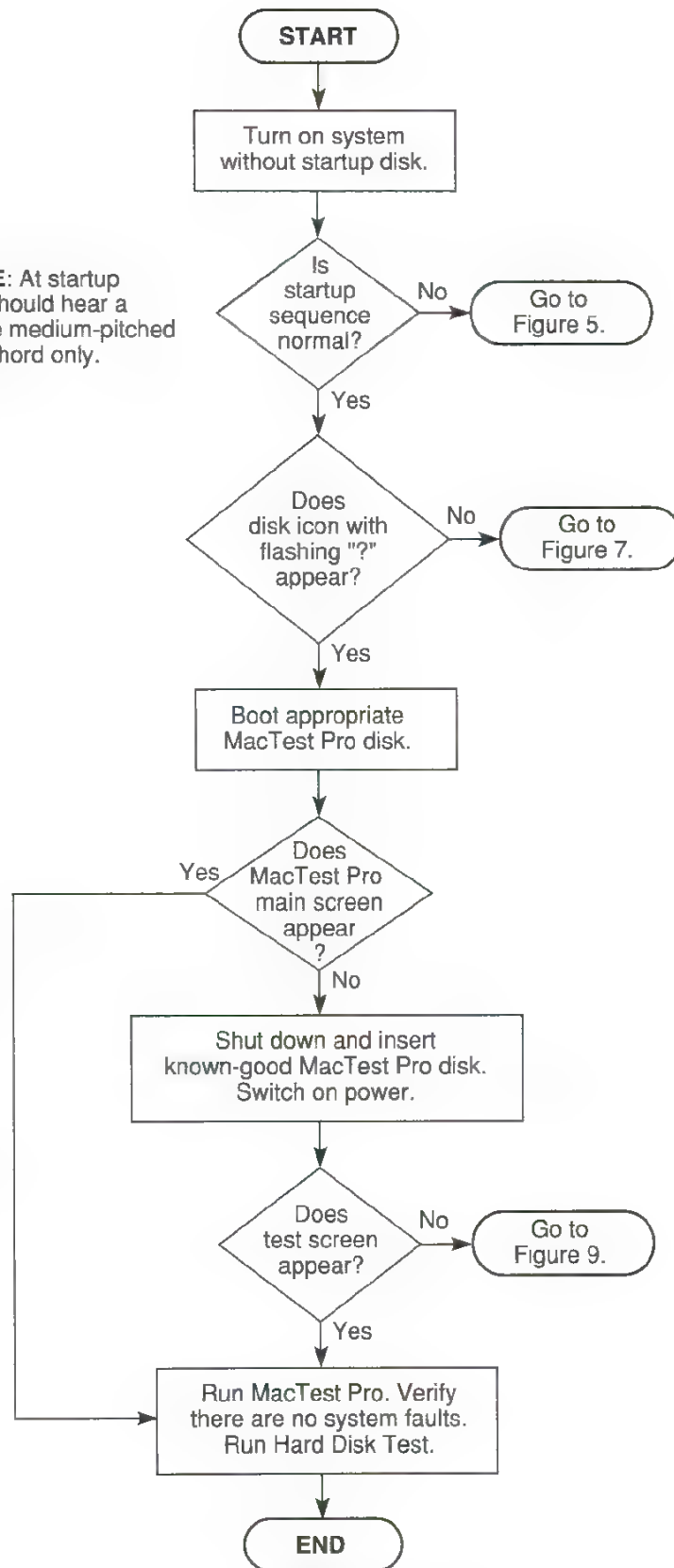
- **System Self-Tests**—Start up the customer's system, listen for diagnostic error chords.
- **Diagnostic Software**—If the system passes the self-tests, but the problem persists, try running the appropriate MacTest Pro program. If you suspect a hard drive problem, run the Macintosh Hard Drive Test also.
- **Symptom/Cure Charts**—If the customer's system (or MacTest Pro) does not boot or MacTest Pro fails to find the problem, refer to the symptom/cure charts in the section that covers your customer's computer. If you think you recognize the problem and you have the necessary replacement module with you, try module swapping.
- **Troubleshooting Flowcharts**—If the customer's system (or MacTest Pro) does not boot or MacTest Pro fails to find the problem and the problem is not clearly defined or not listed in the symptom/cure charts, refer to "Startup Problems—Flowcharts" in this section. These flowcharts present a step-by-step procedure for isolating the problem.

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### **Startup Problems—Flowcharts**

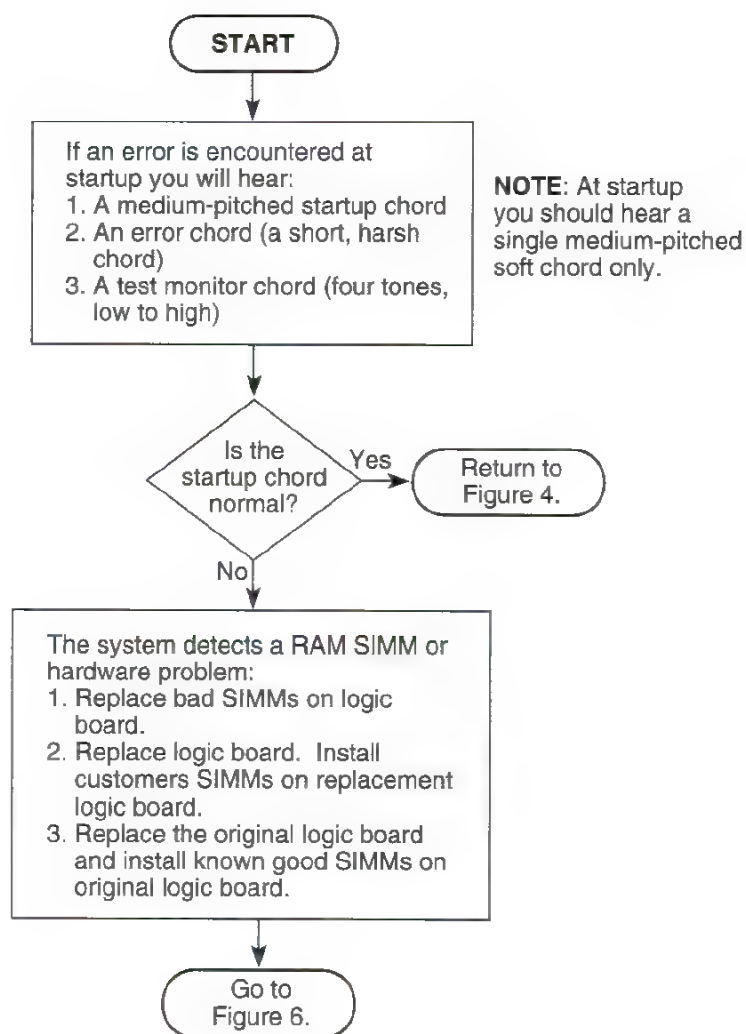
The following flowcharts are geared toward troubleshooting startup problems. If you don't know where to begin, start with Figure 4. Remember, as you follow the flowchart, if the first corrective action doesn't fix the problem, return the system to its original condition and perform the next action.

**NOTE:** At startup you should hear a single medium-pitched soft chord only.

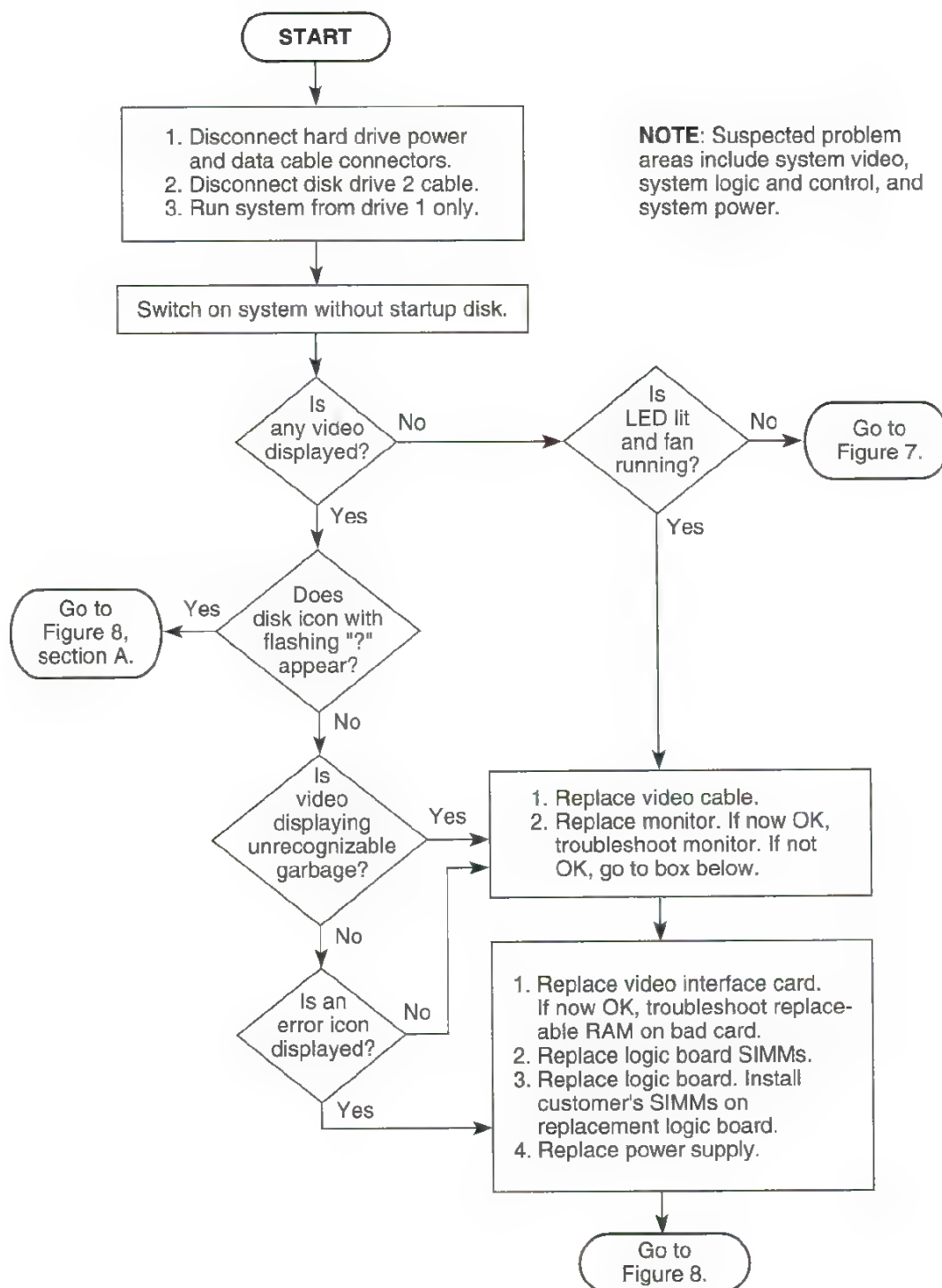


**Figure 4. Startup Problems**

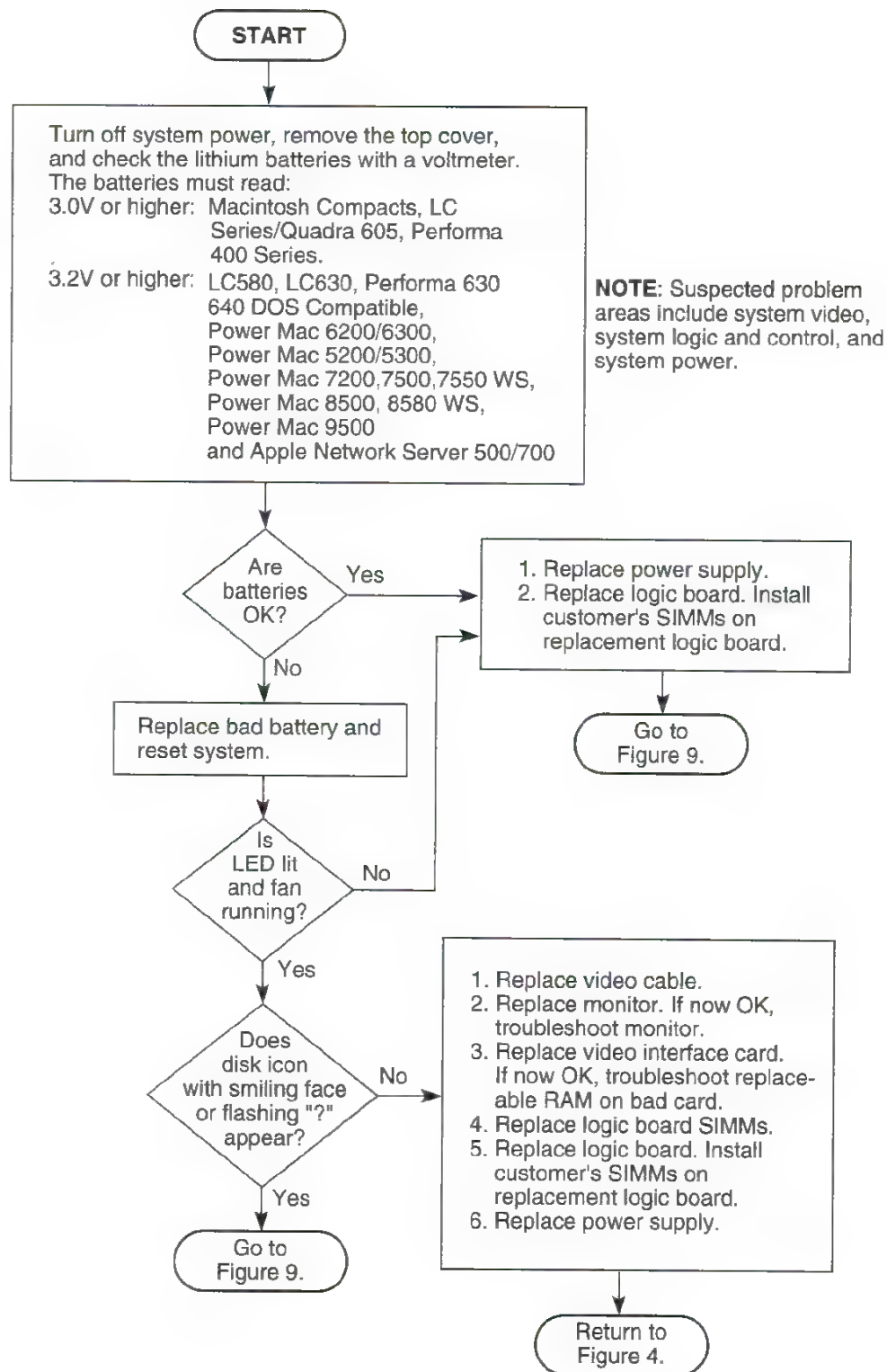




**Figure 5. Startup and Error Chords**



**Figure 6. Startup Problems**



**Figure 7. Startup Problems**

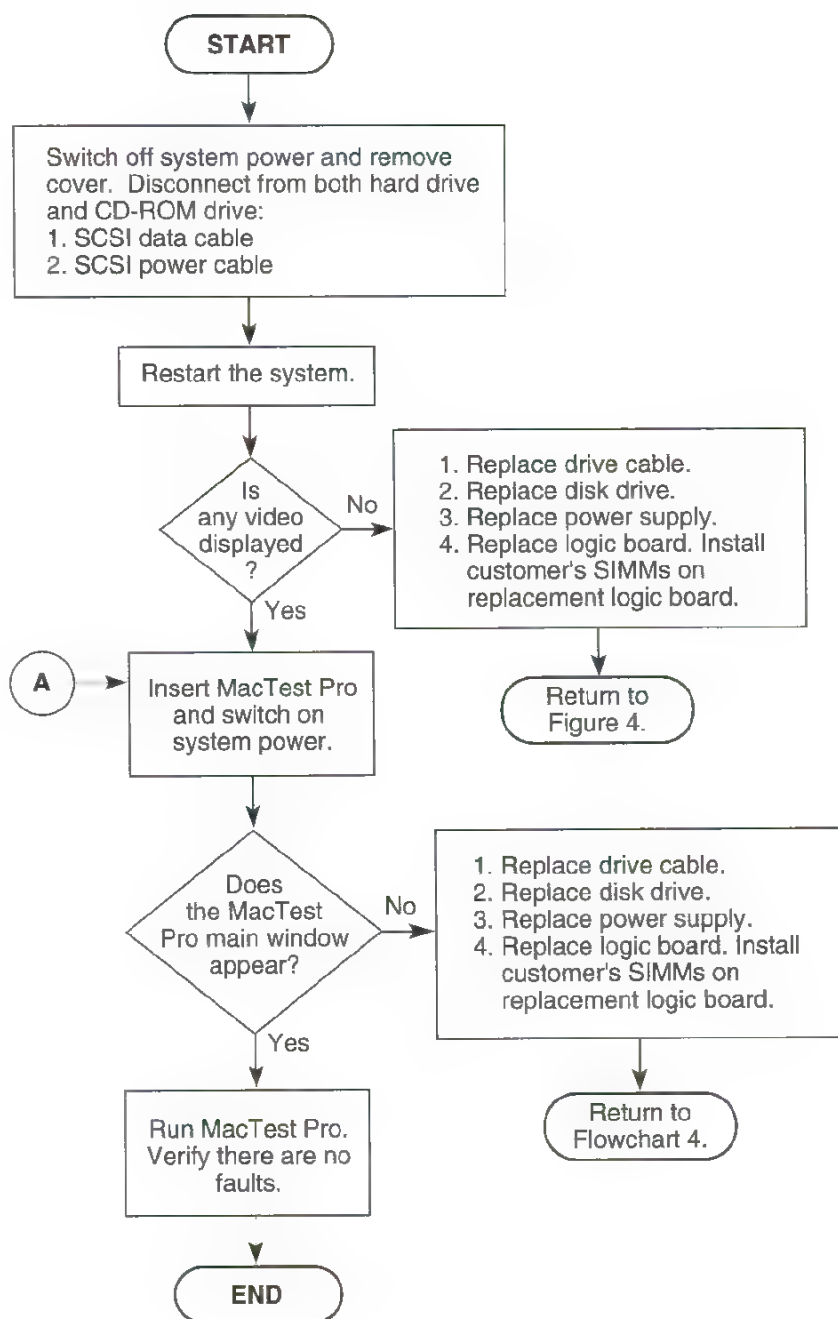
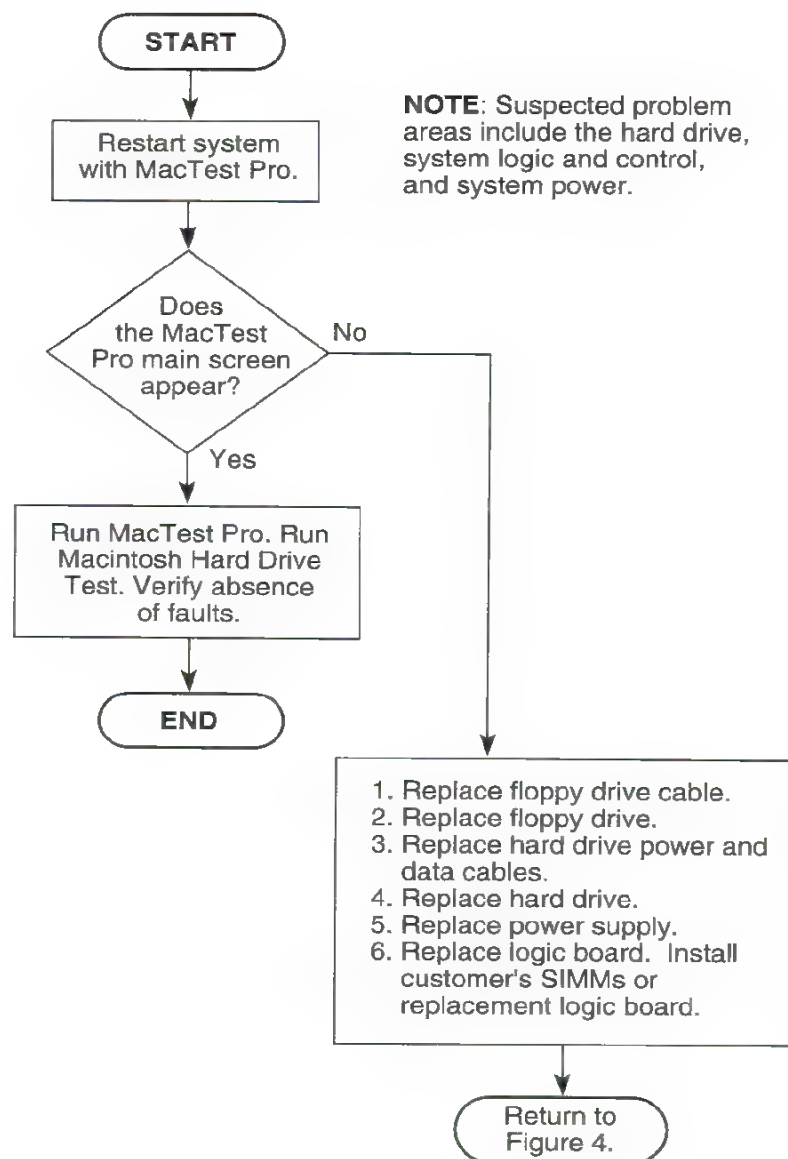


Figure 8. Startup Problems





**Figure 9. Startup Problems**

## Software Troubleshooting

When dealing with software, here are some tips to remember:

- **Installation**—To prevent potential conflicts when installing software, first turn off all system extensions. Also, temporarily turn off any virus detection software running in the background.
- **Emergency Quit Command**—If your system locks up or crashes, avoid simply turning off the computer, because doing so can damage open applications. Instead, try one of the following emergency quit commands. Simultaneously press the:
  - Command, Option, and Escape keys.
  - Command, Control, and Restart (power on) keys.
  - If neither of these commands works, use the programmer's switch to restart the computer.
- **Improving System Performance**—The following steps may help improve the performance of the system:
  1. Turn off virtual memory in the Memory control panel.
  2. Turn off "calculate folder size" in the Views control panel.
  3. Turn off file sharing.
  4. Rebuild the desktop.
  5. For computers with a 68040 processor, check that the 040 cache is on in the Cache Switch control panel.

## Software Problems

Table 1 lists various software problems, their symptoms, causes, and remedies.

Table 1. Software Problems	
Problem	Causes and Remedies
<b>Unexplained system crashes, corrupted or disappearing files.</b>	<p>Cause: Computer has become infected with a virus after using an infected program (often contracted from shareware found on electronic bulletin boards).</p> <p>Remedy: Run an antivirus program to eradicate the virus, and practice virus prevention in the future. To eradicate a virus, boot the computer from a startup disk that contains an antivirus application and launch the eradication program.</p> <p>To prevent future virus infection, use an antivirus application program to screen all disks for known viruses. In addition, make sure all master disks remain locked.</p> <p>Note: Be sure the virus program is compatible with your system software. Incompatible versions can cause unexpected problems that are difficult to track down.</p>
<b>Problems occur with one file only</b>	<p>Cause: File is corrupt.</p> <p>Remedy: Recover data using Norton Utilities, ResEdit, or other data recovery tools. Delete corrupt file.</p>
<b>Problems occur with one application only.</b>	<p>Cause: Application is corrupt, incompatible with system software, or missing from hard drive.</p> <p>Remedy: Update application or reinstall application from original disks.</p>
<b>Applications quit unexpectedly or freeze at any time. System crashes. Computer hangs up when idle. Many other symptoms.</b>	<p>Cause: Extension, control panel, or INIT is corrupt or incompatible with system software, application, or another extension.</p> <p>Remedy: Disable all nonstandard extensions. Then enable extensions one at a time until you find the problem. For more information, reference the Troubleshooting Extensions section later in this chapter.</p> <p>Note: Extensions are sometimes also called INITs; they are usually in the Extensions Folder or the Control Panels folder within the System Folder.</p>

**Table 1. Software Problems (Continued)**

<b>Problems</b>	<b>Causes and Remedies</b>
<b>The Finder cannot locate applications that are on the hard drive, or the Finder is slow. Application and file icons appear as generic rather than custom icons.</b>	<p>Cause: The hard drive is overloaded with applications and icons, or the applications contain an excessive number of file comments. Because the invisible Desktop file keeps information about each program ever installed on the hard drive, the file can become very large. Rebuilding it reduces its size, and as a result applications start up more quickly.</p> <p>Remedy: Rebuild the desktop file by holding down the Option and Command keys while starting up the computer. Click on OK when asked if you want to rebuild the desktop.</p> <p>Note: Rebuilding the Desktop file erases comments from the Get Info comment box of all applications and files on the drive.</p>
<b>At startup, the computer displays a menu bar with no text, the bar freezes, and the cursor alternates between a watch and arrow. The computer never completes the startup sequence. Booting with extensions off and resetting PRAM do not help.</b>	<p>Cause: System is stuck in a loop because the Finder is having trouble with a window coordinate and is not able to draw the window on the screen.</p> <p>Remedy: Start up with the Option key held down. (This procedure forces the Finder to close all open windows.)</p>
<b>A font cannot be dragged out of the Font folder.</b>	<p>Cause: The font is corrupt.</p> <p>Remedy: Move the Font folder from the System Folder to the desktop, drag the damaged font to the trash, and return the Font folder to the System Folder.</p>
<b>The computer takes a long time to start up.</b>	<p>Cause: A large number of new fonts have been added to the system. (Fonts are read in at the time the "Welcome to Macintosh" message displays.)</p> <p>Remedy: Remove unnecessary fonts.</p>



**Table 1. Software Problems (Continued)**

Problem	Causes and Remedies
<p><b>System doesn't start up from hard drive. When system starts up from Installer or Disk Tools, computer displays the error message "System X does not work on this model; you need a newer version that does."</b></p>	<p>Cause: The appropriate system enabler is not in the System Folder or the enabler is corrupt. (The System 7.1 and System 7.5 base systems have built-in support for all Macintosh models that shipped before these systems' release dates. All new models shipping after the release of System 7.1 or System 7.5 include system enabler software specific for that model or family of models.)</p> <p>Remedy: Locate and replace the necessary system enabler file for the computer.</p> <p>Note: System enablers are software modules, specific to a given Macintosh model. A system enabler overrides system resources at startup to allow existing system software to support new Macintosh models. This mechanism eliminates the need to release computer-specific system software each time a new Macintosh model is released. System enablers are located at the top level of the System Folder—not in the Extensions folder.</p>
<p><b>When you try to use the Installer, you see a message indicating the Installer is out of memory.</b></p>	<p>Cause 1: There's not enough memory available to open the Installer. Usually this means that your disk cache or RAM disk is set too high.</p> <p>Solution 1: Quit all open application programs. Also, open the Memory control panel, set your disk cache to the lowest possible setting and turn on Virtual Memory.</p> <p>Cause 2: Your Macintosh has less RAM than is required to use System 7.5, QuickDraw GX, PowerTalk, or a combination of these.</p> <p>Solution 2: Open the Apple menu and choose About This Macintosh. Look at the number next to "Total Memory," and follow these guidelines:</p> <p>If memory equals at least 8,192K (16,384K on a Power Macintosh), you can install System 7.5 with QuickDraw GX and PowerTalk.</p> <p>If memory equals 4,096K (8,192K on a Power Macintosh), you can install only System 7.5. You must add additional RAM before installing QuickDraw GX or PowerTalk.</p>

**Table 1. Software Problems (Continued)**

<b>Problem</b>	<b>Causes and Remedies</b>
<b>When you try to use the Installer, you see a message indicating there is not enough disk space available</b>	<p>Cause: Your computer's hard drive has less than the minimum amount of space required to install the software.</p> <p>Solution: Make more space available on your hard drive by removing some files from the disk. Make backup copies of the files, if necessary, and then drag them to the Trash.</p> <p>If you're installing from floppy disks, you can also try starting up your Macintosh using the Install Disk 1 disk. Using the Installer this way requires less disk space.</p>
<b>When you try to use the Installer, you see a message indicating the System file cannot be modified (or repeated messages asking if it's OK to modify the System file).</b>	<p>Cause 1: You have installed virus-protection software that guards against modification of the System file.</p> <p>Solution 1: Turn off your virus-protection software by dragging it out of the System Folder and restarting your computer. You can turn the virus-protection software back on after installation.</p> <p>If you're installing from floppy disks or a CD, you can also try disabling your extensions by holding down the Shift key while you restart the computer. (If you're installing over a network, you must leave the extensions on in order to connect to the network server.)</p> <p>Cause 2: Your System Folder may be protected, or the System and Finder files may be locked.</p> <p>Solution 2: To turn off the System Folder protection, go to the General Controls or Performa control panel (depending on your version of system software). To see if your System file or Finder file is locked, select the file's icon, then choose Get Info from the File menu. To unlock the file, check the locked checkbox to remove the 'X.'</p>
<b>The system doesn't recognize or start up from the hard drive.</b>	<p>Cause: The startup instructions (boot blocks) on the hard drive are damaged or the hard disk driver is damaged.</p> <p>Remedy: Restart your computer by booting from the Disk Tools floppy disk.</p>

**Table 1. Software Problems (Continued)**

Problem	Causes and Remedies
<b>A serial device (modem, printer) is not responding or the computer displays an error message that the port is already in use.</b>	<p>Cause: Parameter RAM (PRAM) is corrupt. When an application crashes, it sometimes executes code that corrupts parameter RAM. Resetting PRAM can often be an important troubleshooting step—particularly when serial devices are connected to the computer or when networking software is in use.</p> <p>Remedy: Reset PRAM by holding down the Command, Option, P, and R keys during startup but before “Welcome to Macintosh” appears.</p> <p>Note: Resetting PRAM changes the computer’s system to the factory defaults, so anything that has been customized (like background or highlight color) is reset and AppleTalk will most likely be turned off. After resetting PRAM, be sure to recustomize the control panels and restart the computer.</p>
<b>The computer displays “insufficient memory” error messages, applications won’t run, or system performance is degraded.</b>	<p>Cause: Insufficient memory is allocated for the application, or RAM cache is set too high. RAM cache acts as a special RAM buffer between applications and drives and can significantly increase application speed. Memory problems occur when RAM cache is set too high, leaving insufficient system memory for running individual applications.</p> <p>Remedy: Troubleshoot memory by allocating more memory to the application, closing other applications and windows, turning on virtual memory, switching off RAM cache, or reducing the amount of memory allocated to RAM cache.</p>

### **Troubleshooting Extensions: System 7.5**

To troubleshoot extensions using System 7.5 software, follow these steps:

1. Start up the computer while you hold down the Space bar.
2. Release the Space bar when the Extensions Manager control panel opens
3. Go to the Sets menu and select System 7.5 Only. (This procedure deselects all non-standard extensions and control panels, such as virus protection, screen savers, compression utilities, etc.)
4. Close the Extensions Manager control panel to continue startup.

5. Attempt to recreate the original problem. If you cannot, continue these steps to determine which of the nonstandard extensions is causing the problem.
6. Open the Extensions Manager control panel, turn on one of the disabled extensions by clicking its name, and restart the computer.
7. Attempt to recreate the original problem.
8. Repeat the previous two steps for each disabled extension until the problem recurs. The last item enabled is probably the cause of the problem.
9. Check the problem extension's version number for compatibility. Try reinstalling the extension from original floppy disks, or contact the software vendor.

**Note**

If you are unable to find the problem extension after testing all nonstandard extensions, perform a clean install of the system software.

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**Troubleshooting Extensions: Non System 7.5**

To troubleshoot extensions using system software other than System 7.5, follow these steps:

1. Start up the computer while you hold down the Shift key. Release the shift key when you see the message "Welcome to Macintosh – Extensions Off."
2. Attempt to recreate the original problem. If you cannot, continue these steps to determine which of the extensions is causing the problem.
3. Create a new folder on the desktop and name it "Disabled Extensions."
4. Check the Extensions folder, Control Panels folder, and root level of the System Folder for non-Apple system extensions and control panels (such as virus protection, screen savers, compression utilities, etc.).
5. Drag these nonstandard items to the Disabled Extensions folder.
6. Close the System Folder, and restart the computer.
7. Move one item from the Disabled Extensions folder onto the closed System Folder icon and restart the computer.
8. Attempt to recreate the original problem.
9. Repeat the previous two steps for each item in the Disabled Extensions folder until the problem recurs. The last item returned to the System Folder is probably the cause of the problem.



- 
10. Check the problem extension's version number for compatibility. Try reinstalling the extension from original floppy disks, or contact the software vendor.

**Note**

If you are unable to find the problem extension after testing all non-standard extensions, perform a clean install of the system software.

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## **Disk Tools**

The Disk Tools disk that comes with your system software includes a System Folder and two utilities—Disk First Aid and Apple HD SC Setup. Because Disk Tools includes a System Folder, you can use the disk to boot up your Macintosh when you have a problem starting from the hard drive.

To start up from Disk Tools, insert the disk into the floppy drive and turn on the Macintosh. The Disk Tools icon should display in the upper right corner, and your hard drive should appear below it.

**Note**

If you do not see the hard drive icon after you start up from Disk Tools, the problem may be with the hard drive itself and not with the software.

## **Disk First Aid**

Use Disk First Aid to check your internal hard drive for directory problems, especially after a system crash.

If Disk First Aid finds a problem it can't repair, you may want to try third-party disk utilities to correct the problem. However, if you cannot repair the drive, you need to reformat it. Make sure you have a backup of your data before reformatting. If you don't have a backup, you may want to consult with a service provider who specializes in hard drive recovery.

## **Apple HD SC Setup**

Use Apple HD SC Setup to test your hard drive, reinstall/update hard disk drivers, or reformat the drive.

**Note**

Apple HD SC Setup is a disk formatting utility for Apple hard drives. If you have a third-party hard drive in your Macintosh, you get the message that Drive Selection Failed when you launch Apple HD SC Setup. In this case, use the third-party disk formatting utility that came with your drive, or contact the vendor of the drive.

### MacTest Pro

MacTest Pro is a software-based diagnostic program that can help you identify problems with malfunctioning Macintosh computers and peripherals. Its modular design and the availability of individual test modules allow you to customize MacTest Pro for testing in different environments. You can use the MacTest Pro program to test peripheral products (such as Apple CD-ROM drives) and hard drives, when they are attached to a Power Macintosh computer.

MacTest Pro uses the standard Macintosh Operating System environment. Therefore, MacTest Pro requires that enough of the computer's hardware be working properly to run the operating system. If enough of your system is functioning to boot from a floppy disk or a CD-ROM disk, you can use one of the bootable MacTest Pro CD or Emergency disks. With these you can

- Check the integrity of directory and system files (including system, finder, enabler, fonts, etc.)
- Test the basic operation of the logic board, RAM, VRAM, and hard drives
- Use the test looping function to check for intermittent problems

In most cases, you'll want to run the MacTest Pro Emergency application from the MacTest Pro CD or from a bootable disk before running the full MacTest Pro application. This allows you to test the basic operation of the logic board, RAM, VRAM, and hard drive by using the "known-good" system software provided on the bootable MacTest Pro Emergency disk or the CD.

### Versions of MacTest Pro

There are two separate versions of MacTest Pro currently available. One is for 680x0-based Macintosh computers powered by one of the Motorola 680x0 chips (68000, 68020, 68030, 68040 and 68040LC), and for 680x0-based Macintosh computers which have been upgraded with the Power Macintosh Upgrade Card or the Macintosh Processor Upgrade Card.

#### Note

The disks and application in each group are NOT interchangeable — in other words, the applications and test modules included in the CD and disks for 680x0-based Macintosh systems will not run on Power Macintosh systems and vice versa.

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## How to Obtain MacTest Pro

MacTest Pro software is available for purchase as part of the Macintosh Family Diagnostic Starter Kit (Service Part Number 077-8312). The subscription must be renewed yearly in order to continue receiving updates and revisions to diagnose and test new Macintosh products. The Power Macintosh Family Diagnostic Renewal Program service part number is 011-7091.

### Note

The contents of the MacTest Pro CD and disks for 680x0-based Macintosh computers will NOT be updated after the February 1996 diagnostic mailing. After February 1996, the MacTest Pro User's Guide, CD, and disks for 680x0-based systems will only be available in the Macintosh Family Diagnostic Starter Kit. It's very important that you retain the 680x0-based set that you received in the February update mailing.

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## Apple System Profiler

The Apple System Profiler (ASP) is a utility that gathers, summarizes, and delivers key pieces of system configuration information (for example, processor clock speed, disk cache size, non-Apple installed extensions, etc.) needed to effectively and efficiently troubleshoot customers' systems.

Apple System Profiler 1.0 supports the following systems running System 7.5.2 and 7.5.3:

- Power Macintosh 9500, 8500, 7500, 7200, 8100, 7100, and 6100 series
- PowerBook 5300, 2300, and 190 series
- Performa 5200, 5300, 6200, and 6300 series

This system utility enables you to facilitate and enrich the problem resolution process by supplying certain key system configuration information.

The release of ASP will coincide with the System 7.5.3 update. Apple System Profiler, along with an installer, will be available in the Apple Extras folder on new systems that ship with System 7.5.3. By launching the installer, the application will be placed automatically in the Apple Menu Items folder for easy access.

## CompTIA Module Symptom Codes

Apple adopted the CompTIA Module Symptom Codes in July 1994 to replace company-specific codes used previously. The industry association, CompTIA, is sponsoring the use of these codes by all personal computer service providers.

When returning a defective module to Apple, always enter the symptom code that best describes the problem. If you are using the CompTIA form, enter the six-digit CompTIA code in the CODE field (see Figure 10) on the form.

Field

- 1 Enter the Operating System Code
- 2 Enter the Modifier Code
- 3-5 Enter the Observed Condition Code (three-digit code)
- 6 Enter the Action Code

PARTS	VENDOR PART #	QTY	DESCRIPTION	Field						PO #
				1	2	3	4	5	6	
1.										
2.										
3.										

**Figure 10. CompTIA Failure Code Reference**

AppleOrder, the electronic order management tool, implements the CompTIA failure codes in a four-digit format. Select an Observed Condition Code and a Modifier Code by pointing to and clicking on the symptom that best describes the problem. These codes appear in the "Observed Condition" field on the AppleOrder 3.0 form (see Figure 11).

SELECT PART	DESCRIPTION	EXCH PRICE	QTY	OBSERVED CONDITION
1. 661-0733	LGC BD, 16MHZ, MAC COLOR CLASSIC	238.500	1	501-C
2. 661-0763	MOUSE II, DESKTOP BUS	56.700	1	406-C
3.				
4.				

**Figure 11. AppleOrder 3.0 Failure Code Reference**

The Apple SRO form also implements the codes in a four-digit format. If you are using the SRO form, write the three-digit Observed Condition Code followed by a one-digit Modifier Code in the "Repair Confirmation Code/Symptom Code" section on the form.



**Table 2. CompTIA Module Symptom Codes**

<b>Operating System Code</b>		<b>Observed Condition Code (Con't)</b>	
Not applicable	A	<b><u>Display</u></b>	
DOS	B	No Video	201
Windows	C	Unstable Video	202
Windows NT	D	Focus/Coverage	203
OS/2	E	Poor Resolution	204
UNIX	F	No Back Light	205
Apple II	G	Color(s) Missing	206
Macintosh	H	Pin Cushioning	207
Novell	I	Horizontal/Vertical Bright Lines	208
Banyan	J	Rolls Vertically	209
		Diagonal Stripe	210
		Fan Not Spinning	211
		D storted Sound	212
		Cannot Adjust Contrast	213
		Random Character on Display	214
		Dim or Low Intensity	215
		Incorrect Picture Size/Alignment	216
		Won't Show Second Monitor	217
		*Mechanical	299
<b>Modifier Code</b>		<b><u>Drives, Internal or External</u></b>	
Not applicable	A	Noisy	301
Continuous	B	Will Not Spin	302
Intermittent	C	Read/Write Error	303
Fails after warm up	D	Format Error	304
Environmental	E	ID Error	305
Configuration - Peripheral	F	Lost Records	306
Damaged	G	Bad Sectors	307
		Drive Will Not Mount	308
		Not Recognized w/Utility or Formatter	309
		Will Not Accept Disk	310
		Disks Do Not Work in Another Drive	311
		Will Not Boot, Reads and Writes OK	312
		*Mechanical	312
<b>Action Code</b>		<b><u>Input Devices</u></b>	
Return	A	Keyboard Locks Up	401
Adjust	B	Sticky Key	402
Reseat	C	Inoperative Key	403
No Action	D	Incorrect Key	404
Reload	E	Foreign Substance Spilled on Unit	405
Configure	F	Pointing Device Not Tracking Properly	406
		Jittery/Intermittent	407
		Mechanical Failure	408
		Bad Cord/Cable	409
		Locks Up System	410
		No Response, Logic Board OK	411
<b>Observed Condition Code</b>			
Good part	101		
No power/power light	102		
Will not boot from hard disk drive	103		
Mechanical	104		
Damaged	105		
System hangs up	106		
Intermittent	107		
Cosmetic	108		
Screen bright, no Mac face	109		
Reset problem	110		
Hibernation/sleep problem	111		

\* Codes added by Apple, not on CompTIA list

Table 2. CompTIA Module Symptom Codes (Continued)

Observed Condition Code (Con't)		Observed Condition Code (Con't)	
<b><u>Boards</u></b>		<b><u>Printer/Fax</u></b>	
Memory Error	501	Print Quality (include sample)	701
Keyboard/Pointing Device Error	502	Paper Handling	702
Hard Drive Error	503	Accessories	703
Floppy Error	504	Overheating	704
Video Error	505	PCB	705
Tape Drive Error	506	Scanner	706
Network Card Error	507	Communication	707
Communications Error	508	Software	708
Configuration Error	509	No Power Light	709
Parallel Ports	510	Improper Print Head Movement	710
Serial Ports	511	Select Button Inoperable	711
Set Up	512	Fails Self Test	712
Wrong Beeps/Startup Tone	513	Indicator Lights Suggest Fault	713
Emulation	514	Printer Not Seen By CPU	714
Bad Expansion Slots	515	Self Test OK, Will Not Print From Host	715
Audio Input Not Functioning	516	Prints Blank or Black Pages	716
Audio Output Not Functioning	517	*Mechanical	799
Battery Failure	518		
Inoperative Control Panel	519	<b><u>Multi-Function Device</u></b>	
Dark Screen with Startup Tone	520	Accessories	801
Sad Macintosh	521	Configuration	802
Cannot Shutdown	522	Consumables	803
Known-Good Mouse/Paddle Not Working	523	Engine Error/Fault	804
Bad or No Color, Monochrome OK	524	Facsimile	805
Will Not Run Off AC Power	525	Other Applications	806
*No Power/Power Light	593	Paper Handling (Print Scan)	807
*Will Not Boot from Hard Drive	594	PCB	808
*System Hangs Up	595	^Print/Scan/Image Quality (attach sample)	809
*Screen Bright, No Mac Face	596	Software	810
*Reset Problem	597	System Environment	811
*Hibernation/Sleep Problem	598	Docking Problem	812
*Mechanical	599	*Mechanical	899
<b><u>Power Supply</u></b>		<b><u>Modems</u></b>	
Overheat (Fan problem)	601	Self-Test Fails	901
Random Reset	602	Communication Failure	902
Voltage Missing	603	Will Not Dial	903
Noise/Hum	604	Will Not Answer	904
Crowbar/Chirping	605	Stuck Off Hook	905
Blows Fuses	606	Locks Up	906
Causes System Failures	607	*Buzzes	997
UPS Battery Replacement Indicated	608	*Drops Line	998
UPS Power-On Indicator Not Lit	609	*Mechanical	999
*Mechanical	699		

\* Codes added by Apple, not on CompTIA list

^Description changed by Apple 3/22/94

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## Apple Restoration CD

Use the Apple Restoration CD to quickly and accurately restore system software and custom market third-party bundles to like-new condition during repair or upgrade. Apple offers two distinct lines of Restoration CDs—Apple Restoration CD for System Software subscription and the Apple Restoration CD Market series. Both Apple Restoration CDs include the following features:

- Bootable CD technology
- At Ease interface
- Fast installation—4 megabytes restored in 1 minute
- A variety of Apple disk utilities (such as Disk First Aid and HD SC Setup)
- A familiar installer interface
- Easy-to-follow User's Guide
- Additional documentation (in an on-line Read Me file)
- Compatibility with AppleCD SC Plus, AppleCD 150, AppleCD 300, and AppleCD 600 drives.

---

### Restoration CD for System Software

The Apple Restore CD for System Software is a yearly subscription that includes all versions of system software from system 6.0.8 forward. This product provides software and installers that allow technicians to restore the original software that shipped on an Apple computer, peripheral, printer, or networking card. Included with this subscription is also the necessary software for initializing, updating, and repairing hard drive directories. Purchasing the Apple RestorationCD for System Software subscription will provide you with regular system software updates when Apple releases new products or revises products.

Apple Restoration CD for System Software .....077-8000  
Renewal, Apple Restoration CD for System Software .....077-0113

## Restoration CD for Market Software

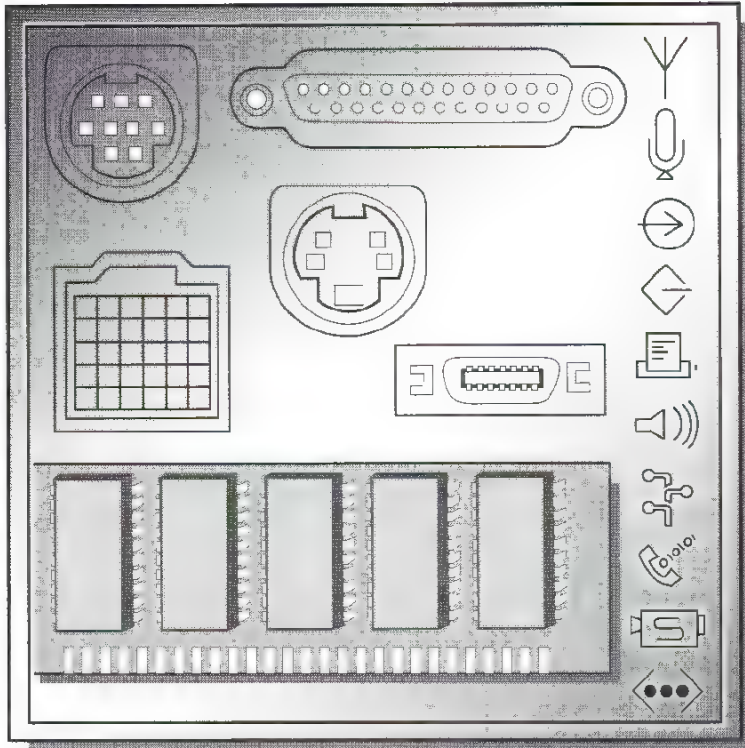
Restoring software can be particularly difficult when third-party applications are bundled with the customers unit at the time of sale. Specifically designed for this situation, the Apple Restoration CDs for Market Software come complete with the correct version of system software and all the original applications that were bundled for specific markets or promotions. Each Restoration CD in this series is sold separately. As of February 1996, the following volumes are offered:

Volume 1, Restoration CD for Market Software (MAR '94)	
Consumer/Performa Software .....	600-1432
Volume 2, Restoration CD for Market Software (FEB '94)	
Education Software for AELC, Back to School & Educator Advantage .....	600-1397
Volume 3, Restoration CD for Market Software (JUN '94)	
Education & Consumer Software .....	600-1585
Volume 4, Restoration CD for Market Software (SEP '94)	
Systems Remarketing & Performa 500, 630 Series, and 637 .....	600-1752
Volume 5, Restoration CD for Market Software (JAN '95)	
Fall 1994 software for Performa 6100 Series & AELC .....	600-1977
Volume 6, Restoration CD for Market Software (MAY '95)	
Spring 1995 Performa Software for 5200LC/75 & 640CD DOS .....	600-2616
Volume 7, Restoration CD for Market Software (JAN '96)	
Fall 1995 Performa Software for 6205CD, 6214CD & 6216CD .....	600-3647
Volume 8, Restoration CD for Market Software (JAN '96)	
Fall 1995 Performa Software for 5215CD, 6200, 6218 & 6220CD .....	600-3648
Volume 9, Restoration CD for Market Software (JAN '96)	
Fall 1995 Performa Software for 5200CD & 6230CD .....	600-3649
Volume 10, Restoration CD for Market Software (JAN '96)	
Summer 1995 Education Software for LC580 & LC5200/75 .....	600-3650





# Ports, Pinouts, and Memory



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## Cable Connectors

The pin numbers shown below are for the connectors attached to the ends of the Macintosh peripheral cables, as viewed from the front of the connector.

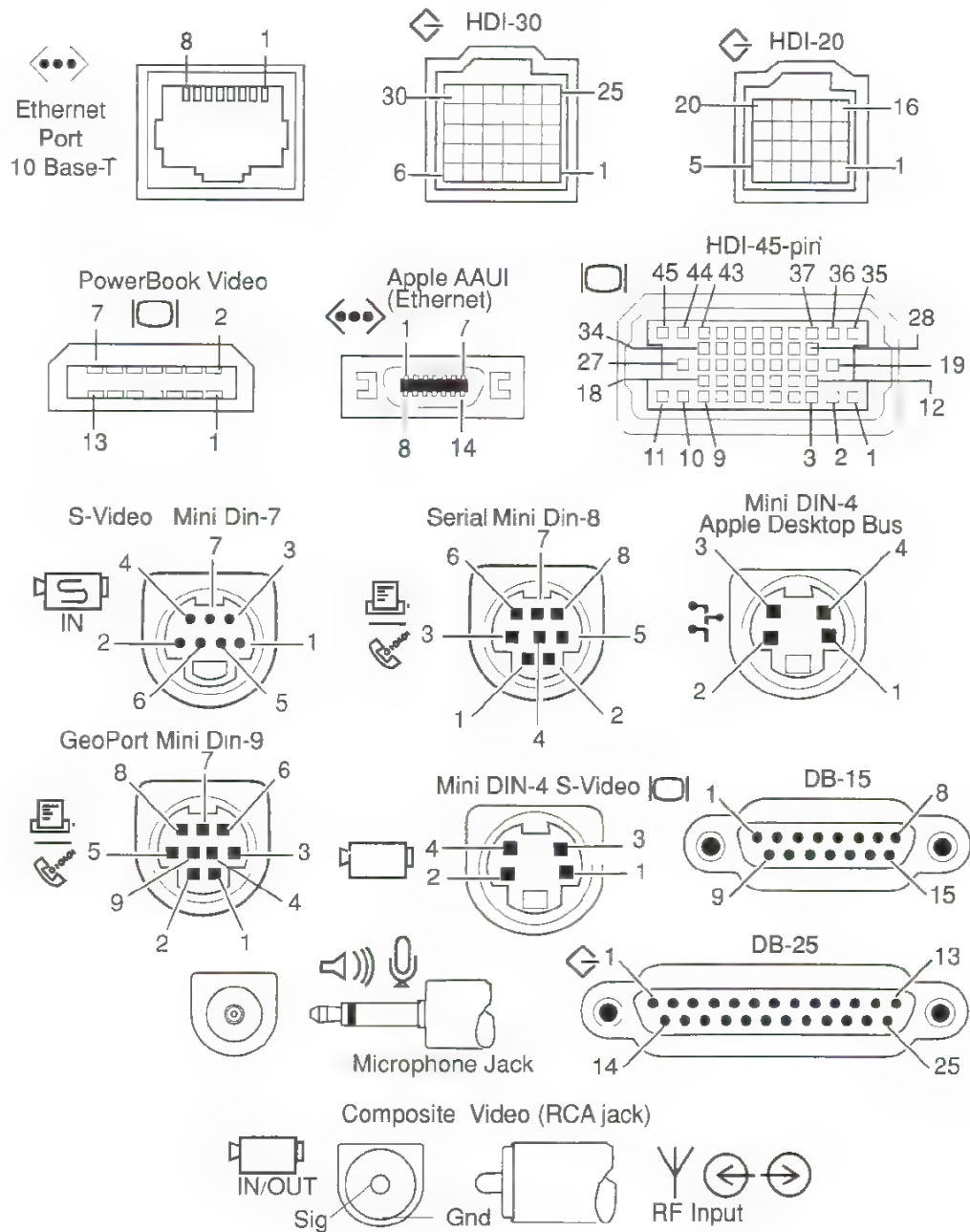


Figure 12. Cable Connectors

## Pinouts

### GeoPort: Mini DIN-9

The back panel of all Power Macintosh models contain two I/O ports for serial telecommunication data. Both sockets accept 9-pin plugs allowing either port to be independently programmed for asynchronous or synchronous communication formats up to 9600 bps. This includes AppleTalk and the full range of Apple GeoPort protocols.

Pin	Name	Function
1	SCLK (out)	Reset pod or get pod attention
2	Sync (in)/SCLK (in)	Serial clock from pod (up to 920 Kbit/sec.)
3	TxD-	Transmit -
4	Gnd/shield	Ground
5	RxD-	Receive -
6	TxD+	Transmit +
7	Wake up/TxHS	Wake up CPU or do DMA handshake
8	RxD+	Receive +
9	+5V	Power to pod (350 mA maximum)

### Apple Desktop Bus Connector

Connector type: Mini DIN-4 male. The total length of all cables should not exceed 16 feet (5 meters).

Pin	Signal Name	Signal Description
1	Data	Bidirectional data bus
2*	Power On/	Signal momentarily grounded to pin 4 to begin power-up sequence in CPU
3	Power	+5 volts
4	Ground	Signal ground
* On the Macintosh II family, Quadra 700 and 900, and PowerBook series only. Pin 2 is unused on all other models.		

---

## Modem and Printer Ports

Connector type: Mini-DIN 8

Pin	Signal Name	Signal Description
1	HSKo	Handshake out
2	HSKi	Handshake in/external clock
3	TxD-	Transmit data -
4	GND	Signal ground
5	RxD-	Receive data -
6	TxD+	Transmit data +
7	NC	No connection
8	RxD+	Receive data +

---

## S-Video Input and Output Connectors

The Power Macintosh AV card also contains two identical connectors for S-video input and output, with adapter cables for composite video devices that have RCA connectors, like television equipment.

Pin	Input Connector	Output Connector
1	AGND	AGND
2	AGND	AGND
3	Video Y (luminance)	Video Y (luminance)
4	Video C (chroma)	Video C (chroma)
5	I <sup>2</sup> C clock (I-squared) <sup>1</sup>	Composite video
6	+12V at 250 mA maximum <sup>2</sup>	No connection
7	I <sup>2</sup> C data <sup>1</sup>	No Connection
<div>1. Phillips serial bus</div> <div>2. Fused at 1.1 A</div>		

## HDI-45

The Power Macintosh computers provide connection to AudioVision monitors (and other monitors when used with an adapter cable) by means of an AudioVision HDI-45 monitor socket on their back panel.

Pin	Description	Pin	Description
1	Analog audio ground	24	Reserved
2	Audio input shield	25	Reserved
3	Left channel audio input	26	Red ground (shield)
4	Right channel audio input	27	Red video output (75 ohms)
5	Left channel audio output	28	I <sup>2</sup> C data signal* (I-squared)
6	Right channel audio output	29	I <sup>2</sup> C clock signal* (I-squared)
7	Reserved	30	Reserved
8	Monitor ID sense line 1	31	Monitor ID
9	Monitor ID sense line 2	32	Monitor ID
10	Green ground (shield)	33	Vertical sync signal
11	Green video output (75 ohms)	34	Composite sync signal
12	Video input power ground	35	ADB power +5V
13	Power for camera +5V	36	ADB ground
14	Reserved	37	ADB data
15	Reserved	38	Keyboard switch
16	Reserved	39	Reserved
17	Reserved	40	Reserved
18	Monitor ID sense line 3	41	Monitor ID
19	S-video input shield	42	Horizontal sync signal
20	S-video input luminance (Y)	43	Video sync ground
21	S-video input chroma (C)	44	Blue ground (shield)
22	Reserved	45	Blue video output (75 ohms)
23	Reserved		

\* Phillips serial bus interface



## Ethernet: AAUI Connector Pinouts

The AAUI (Apple Attachment Unit Interface) connector is a 14-position, 0.050-inch-spaced ribbon contact connector. AAUI signals have the same description, function, and electrical requirements as the AUI signals of the same name, as detailed in the IEEE Standard 802.3-1990 CSMA/CD, section 7.

Pin	Signal Name	Signal Description
1	FN Pwr	Power (+12V @ 2.1W or +5V @ 1.9W)
2	DI-A	Data in circuit A
3	DI-B	Data in circuit B
4	VCC	Voltage Common
5	CI-A	Control in circuit A
6	CI-B	Control in circuit B
7	+5V	+5 volts (from host)
8	+5V	Secondary +5 volts (from host)
9	DO-A	Data Out circuit A
10	DO-B	Data Out circuit B
11	VCC	Secondary Voltage Common
12	NC	Reserved
13	NC	Reserved
14	FN Pwr	Secondary Power (+12V @2.1W or +5V @ 1.9W)
Shell	Protective Gnd	Protective Ground

---

### Audio Output Connector: Stereo

Connector type: Stereo miniature phone plug (3.5 mm). The internal speaker is disabled when this connector is in use.

Pin	Signal Name	Signal Description
(Sleeve)	GND	Signal ground
(Tip)	Left	1-volt*, peak-to-peak audio signal with an impedance of 47 ohms, left channel
(Ring)	Right	1-volt* peak-to-peak audio signal with an impedance of 47 ohms, right channel
* The PowerBook series produce a 0.75-volt, peak-to-peak signal.		

---

### Audio Output Connector: Monaural

Connector type: Monaural miniature phone plug (3.5 mm). The internal speaker is disabled when this connector is in use.

Pin	Signal Name	Signal Description
(Sleeve)	GND	Signal ground
(Tip)	AUDIO	.5-volt, peak-to-peak audio signal

---

### Microphone Input Connector

Connector type: Omni directional phone plug (3.5 mm).

#### ▲Caution

**Do not connect any device other than the Macintosh microphone into the microphone input connector. The connector provides +5 volts for the microphone. Connecting incompatible devices could damage the device or computer.**

Pin	Signal Name	Signal Description
(Sleeve)	GND	Signal ground
(Tip)	+5V	+5 volts for powering electret microphone
(Ring)	Mono	Audio input with a maximum amplitude of 20 mV at 600 ohms impedance

## HDI-30 and BR-50 SCSI Disk Adapter Cable

These connectors are found on the SCSI Disk Adapter cable. The pin numbers that are not mentioned are reserved.

HDI-30	BR-50	Signal Name	Signal Description
2	26	/DB0	SCSI data bit 0
1,3	19	GND	Ground, Pin 1 enables SCSI disk mode
4	27	/DB1	SCSI data bit 1
5	38	TERMPWR	Termination Power (not supplied by PowerBook 100)
6	28	/DB2	SCSI data bit 2
7	29	/DB3	SCSI data bit 3
8	1,4	GND	Ground
9	44	/ACK	SCSI acknowledge
10	5	GND	Ground
11	30	/DB4	SCSI data bit 4
12	2,3,8	GND	Ground
13	11,9,6	GND	Ground
14	31	/DB5	SCSI data bit 5
15	24	GND	Ground
16	32	/DB6	SCSI data bit 6
17	7	GND	Ground
18	33	/DB7	SCSI data bit 7
19	34	/DBP	SCSI data bit parity
20	23, 16, 20	GND	Ground
21	49	/REQ	SCSI request
22	21, 22	GND	Ground
23	43	/BSY	SCSI busy
24	25	GND	Ground
25	41	/ATN	SCSI attention
26	48	/C/D	SCSI control/data
27	45	/RST	SCSI bus reset
28	46	/MSG	SCSI message
29	47	/SEL	SCSI select
30	50	/I/O	SCSI input/output

---

## External Video Connector

Connector type: 14-pin, high-density female. All Apple-manufactured Macintosh monitors except the 21-inch Color Display and Two-Page Monochrome Monitor are supported.

Pin	Signal Name	Signal Description
1	RED.VID	Red video
2	RED.GND	Red video ground
3	MON.ID1	Monitor ID, bit 1
4	VSNC/	Vertical sync
5	CSNC/	Composite sync
6	C&VSNC.GND	Composite and vertical sync ground
7	GRN.GND	Green video ground
8	GRN.VID	Green video
9	MON.ID2	Monitor ID, bit 2
10	HSNC.GND	Horizontal sync ground
11	MON.ID3	Monitor ID, bit 3
12	HSNC/	Horizontal sync
13	BLU.VID	Blue video
14	BLU GND	Blue video ground
Shell	CHASSIS GND	Chassis ground

## SCSI Connector: DB-25

Total length of all SCSI cables should not exceed 20 feet (6 meters).

### ▲Caution

**This interface uses the same type of connector as a standard RS-232 serial interface but is electrically very different. Do NOT connect RS-232 devices or cables to this port. Doing so can damage the device and the device and the computer.**

Pin	Signal Name	Signal Description
1	REQ/	Request
2	MSG/	Message
3	I/O/	input/output
4	RST/	Reset
5	ACK/	Acknowledge
6	BUSY/	Busy
7	GROUND	Signal ground
8	Data0/	Data bit 0
9	GND	Signal ground
10	Data3/	Data bit 3
11	Data5/	Data bit 5
12	Data6/	Data bit 6
13	Data7/	Data bit 7
14	GND	Signal ground
15	C/D/	Control/data
16	GND	Signal ground
17	ATN/	Attention
18	GND	Signal ground
19	SEL/	Select
20	PARITY/	Data parity
21	Data1/	Data bit 1
22	Data2/	Data bit 2
23	Data4/	Data bit 4
24	GND	Signal ground
25	TERMPWR	+5 volts terminator power



### SCSI Connector: HDI-30

This connector is present on the Macintosh PowerBook series (except the Duo 210/230).

Pin	Signal Name	Description
1	SCSI-Mode/	SCSI disk mode enable signal
2	Data0/	Data bit 0
3	GND	Signal ground
4	Data1/	Data bit 1
5	Termpwr	+5 volts termination power
6	Data2/	Data bit 2
7	Data3/	Data bit 3
8	GND	Signal ground
9	ACK/	Acknowledge
10	GND	Signal ground
11	Data4/	Data bit 4
12	GND	Signal ground
13	GND	Signal ground
14	Data5/	Data bit 5
15	GND	Signal ground
16	Data6/	Data bit 6
17	GND	Signal ground
18	Data7/	Data bit 7
19	PARITY/	Data parity
20	GND	Signal ground
21	REQ/	Request
22	GND	Signal ground
23	BUSY/	Busy
24	GND	Signal ground
25	ATN/	Attention
26	C/D/	Control/data
27	RST/	Reset
28	MSG/	Message
29	SEL/	Select
30	I/O/	Input/output

---

### External Floppy Drive Connector: HDI-20

This connector is present on the Macintosh Duo MiniDock and PowerBook Duo Floppy adapter. An HDI-20 1.4 MB drive can be connected to this port.

Pin	Signal Name	Description
1	GND	Signal ground
2	GND	Signal ground
3	GND	Signal ground
4	GND	Signal ground
5	NC	No connection
6	+5V	+5 volts DC
7	+5V	+5 volts DC
8	+5V	+5 volts DC
9	+5V	+5 volts DC
10	NC	No connection
11	PH0	Phase 0
12	PH1	Phase 1
13	PH2	Phase 2
14	PH3	Phase 3
15	WREQ/	Write request
16	HDSEL	Head select
17	ENBL2/	External drive select
18	RD	Read data
19	WR	Write data
20	NC	No connection

---

## External Monitor Connector

Connector type: DB-15.

Pin	Description	Pin	Description
1	Red ground	9	Blue video signal
2	Red video signal	10	Monitor sense 2
3	Composite synchronization	11	Synchronization ground
4	Monitor sense 0	12	Vertical synchronization
5	Green video signal	13	Blue ground
6	Green ground	14	Horizontal synchronization
7	Monitor sense 1	15	Horizontal synchronization ground
8	No connection		

---

## Coax/Twinax Interface Card: Twinax Connector

Connector type: DA-15 female.

Pin	Signal Description	Pin	Signal Description
1	No connection	9	No connection
2	No connection	10	No connection
3	No connection	11	No connection
4	No connection	12	No connection
5	No connection	13	No connection
6	No connection	14	"B" twinax signal
7	"A" twinax signal	15	No connection
8	No connection		

## 10Base-T Ethernet Connector: RJ-45 Connector

Contact	Description
1	TD+
2	TD-
3	RD+
4	Not used by 10Base-T
5	Not used by 10Base-T
6	RD-
7	Not used by 10Base-T
8	Not used by 10Base-T

## PlainTalk Microphone

Connector type: Omni directional phone plug (3.5 mm).

### ▲Caution

Do not connect any device other than the Macintosh microphone into the microphone input connector. The connector provides +5 volts for the microphone. Connecting incompatible devices could damage the device or computer.

Pin	Signal Name	Signal Description
(Sleeve)	GND	Signal ground
(Tip)	+5V	+5 volts for powering electret microphone
(Ring)	Right & Left	Audio input with a maximum amplitude of 20 mV at 600 ohms impedance

## Coax/Twinax Interface Card: Coax Connector

Connector type: BNC male

Pin	Signal Name	Signal Description
(Tip)	CX+	Transmit/receive data
(Sleeve)	CX-	Signal ground

---

## DIMM and SIMM Information

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### DIMMs

The Power Macintosh 7200, 7500, 8500, and 9500 series computers use 168-pin, 70 ns or faster DIMMs (Dual In-line Memory Modules) that provide a 64-bit wide data path, compared to a 32-bit data path for SIMMs. It takes one DIMM to meet the 64-bit wide data bus requirement.

DIMMs are “wider” than SIMMs in the amount of data they can carry. SIMMs have 72 pins, DIMMs have 168 pins. The extra pins provide a 64-bit data path. In addition, DIMMs do not have to be installed in pairs like the SIMMs on earlier Machines models. However, to take advantage of memory interleaving (see Note below), the DIMMs should be installed in paired slots. The Power Macintosh 7500, 8500, and 9500 series computers support memory interleaving when DIMMs are installed in pairs. The Power Macintosh 7200 series computers do not support memory interleaving and can be installed one DIMM at a time.

#### Note

Memory interleaving allows the computer to read or write to its memory while other memory reads or writes are occurring, thus providing for faster performance.

---

### SIMMs

SIMMs (Single In-Line Memory Modules) are installed in pairs on the original Power Macintosh 6100, 7100, and 8100 series computers. These 72-pin, 80 ns or faster SIMMs, have a 32-bit wide internal data path. The data bus is 64-bits wide on these computers. Two SIMMs are required to accommodate this data bus.

The Power Macintosh 5200 series computers have a 32-bit wide data bus and can be installed one SIMM at a time. The 5200 series computers have two SIMM slots. Additional memory can be added by filling the other slot with one 72 pin, 70 ns or faster SIMM.





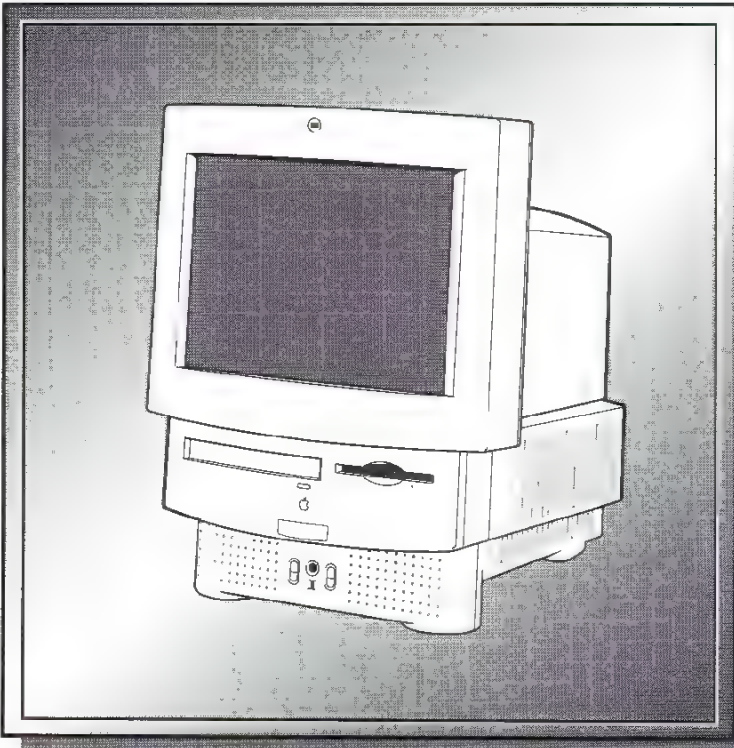
## Memory Matrix

Memory for Service Exchange Modules	Macintosh Computers												
	LC 580	LC/Quadra 630	LC 630 DOS-Compatible	Performa 630 Series	Performa 640 DOS-Compatible	Performs 6200/6300 Series	Power Mac/Performa 5000 Series	Power Mac 7200/75 /90	Power Mac 7500/100	Power Mac 8500/120	Power Mac WS 8550	Power Mac 9500	Apple Network Server 500/700
661-0808 (4 MB, 80 ns, 72 pin)	•	•	•	•	•	•	•						
661-0809 (8 MB, 80 ns, 72 pin)	•	•	•	•	•	•	•						
661-0087 (DRAM, 16 MB, 80 ns, 72 pin)		•		•		•							
661-1036 (DIMM, VRAM, 1 MB, 70 ns, 112 pin)								•	•	•	•	•	
661-0918 (DIMM, DRAM, 8 MB, 70 ns, 168 pin)								•	•	•	•	•	
661-0919 (DIMM, DRAM, 16 MB, 70 ns, 168 pin)								•	•	•	•	•	
661-1035 (DIMM, Cache, 256K, 11 ns, 160 pin)								•	•	•	•	•	
661-1128 (DIMM, DRAM, 8 MB, 60 ns, 168 pin, *												•	
661-1129 (DIMM, DRAM, 16 MB, 60 ns, 168 pin, *												•	
661-1130 (DIMM, DRAM, 32 MB, 60 ns, 168 pin, *												•	
661-0722 (VRAM, 256K, 80 ns, 68 pin)												•	
661-1067 (Card, RAM, 12 MB)													•
661-1658 (Card, RAM, 8 MB)													•
661-1659 (DRAM, Expansion Card, 4 MB)													•
661-0156 (Card, RAM, 8 MB)													•
661-1033 (Card, RAM, 16 MB)													•
*Parity													

Figure 13. Memory Matrix

# Macintosh LC 580

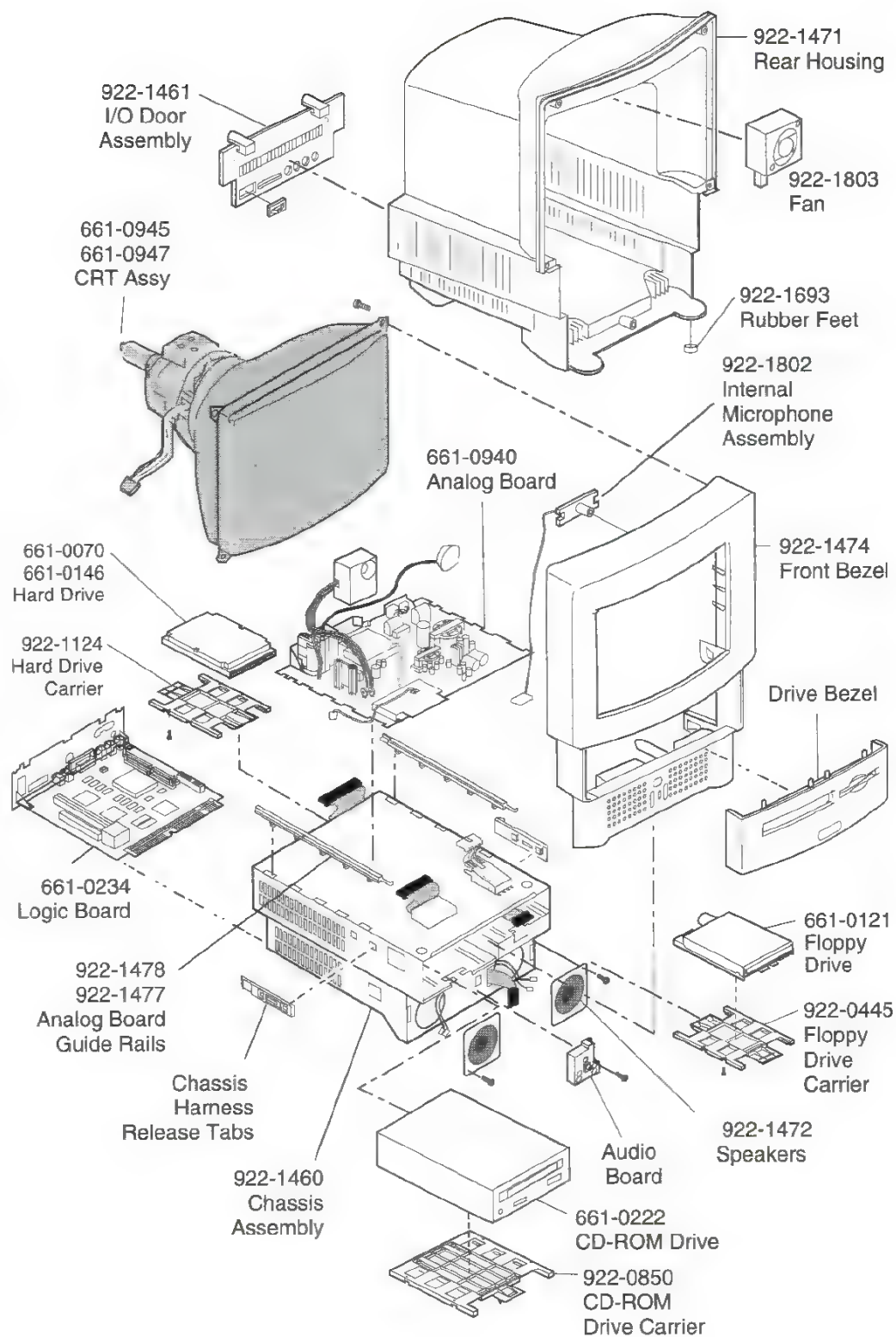
## Performa 580CD



4

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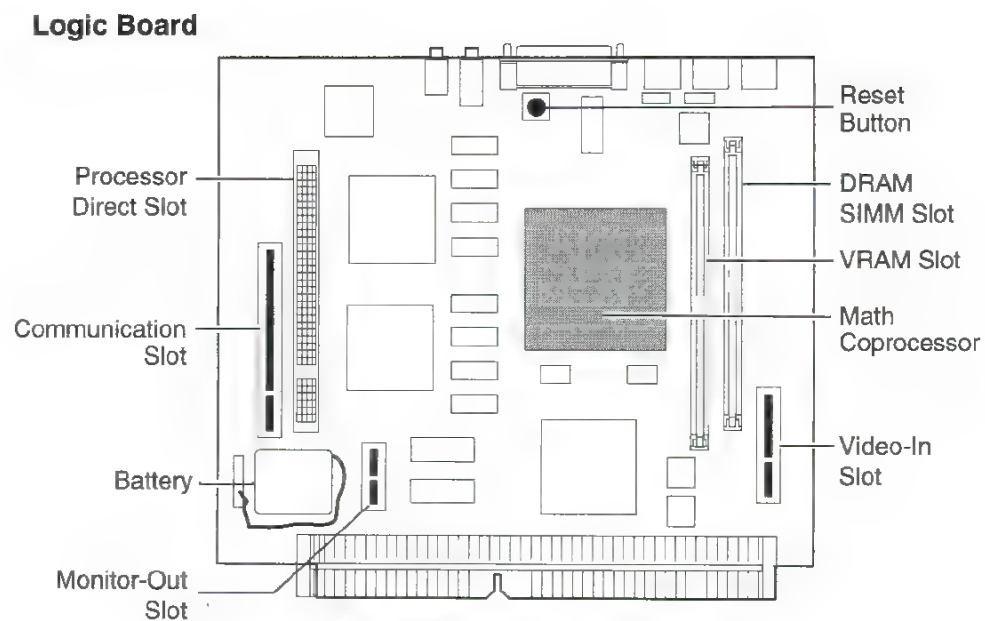
## Exploded View



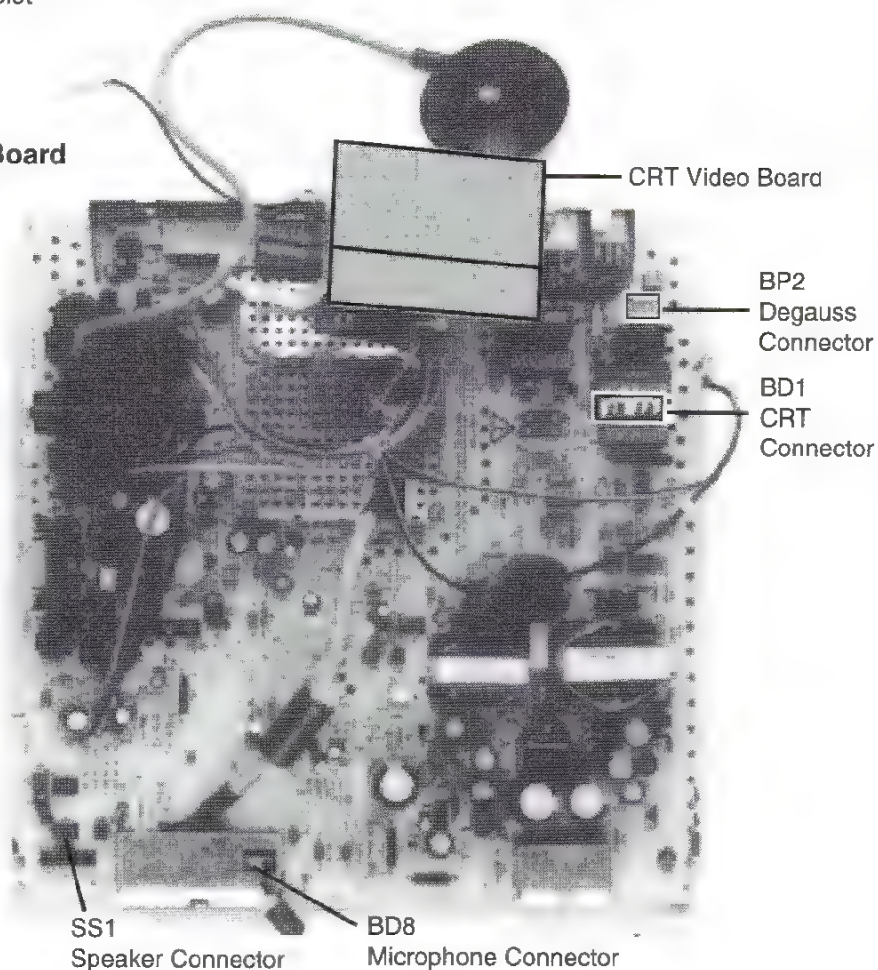
**Figure 14. Macintosh LC 580/Performa 580CD Exploded View**



## Logic and Analog Boards

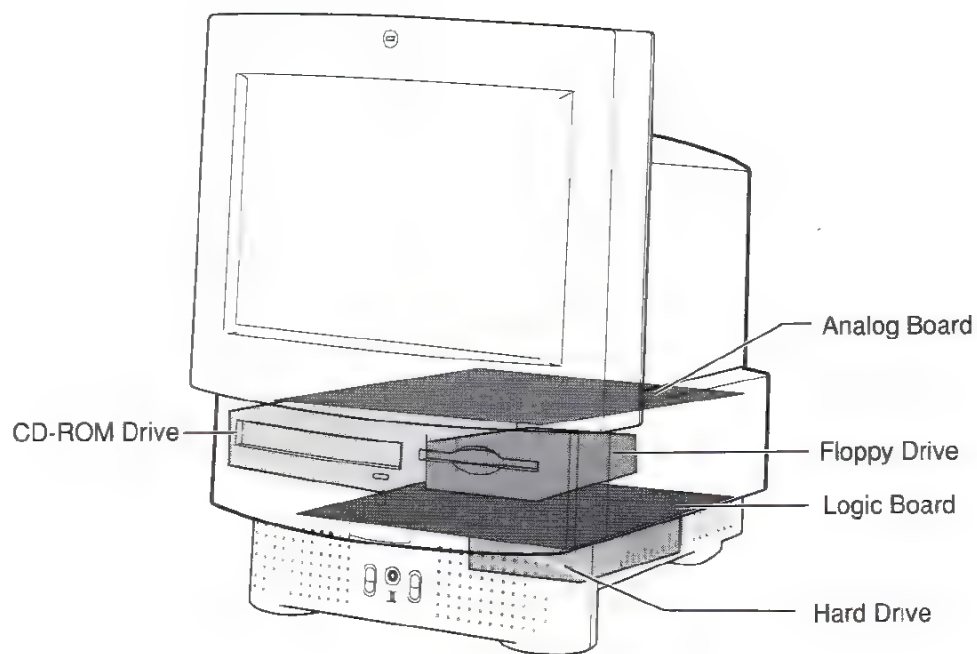
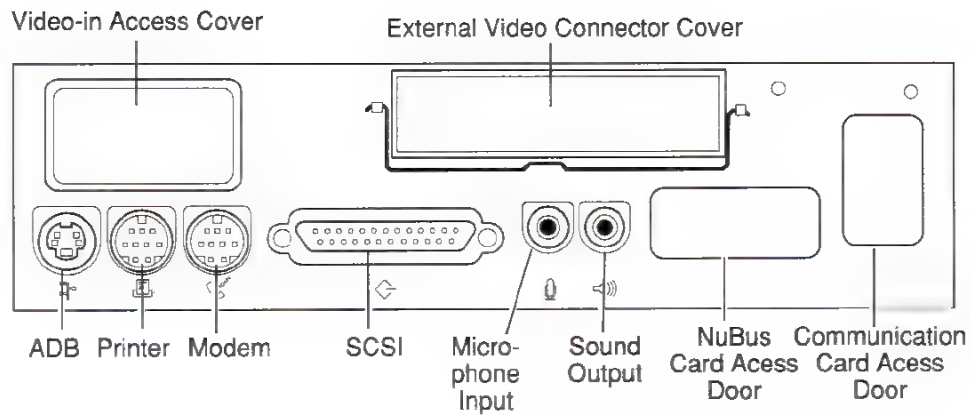


**Analog Board**



**Figure 15. Macintosh LC 580/Performa 580CD Logic and Analog Boards**

## Back Panel and Locator Views



**Figure 16. Macintosh LC 580/Performa 580CD Back Panel and Locator Views**



## Parts List

Battery, Alk., 4.5 V, Velcro Mount.....	922-0750
Bezel, LC 580.....	922-1474
Board, Analog.....	661-0940
Board, Front Panel Control.....	922-1459
Board, Logic, 68LC040/33 with External Video Out.....	661-0234
Cable, MPEG Board (Pkg. of 5).....	922-1568
Card, MPEG Media System.....	661-0995
Carrier, CD-ROM.....	922-0850
Carrier, Hard Drive.....	922-1124
CD Audio Connector (Use with 661-0222).....	922-0766
CD-ROM Drive, Apple CD 300+, Trayloading.....	661-0222
CD/HD Connector, Adapter.....	922-1820
Chassis, Internal.....	922-1460
CRT Assembly, CLR, 14" EQ/POL.....	661-0947
CRT Assembly, CLR, 14" NH/AS/AG.....	661-0945
Door, CD-ROM/Floppy Drive, LC 580.....	922-1464
Door, Common, Rear, I/O.....	922-1461
Door, Floppy Drive, LC 580.....	922-1463
Fan.....	922-1803
Fence, Logic Board.....	922-1523
Floppy Drive, Apple SuperDrive, 1.4 MB, Manual Insert.....	661-0121
Foot, Platinum.....	865-0051
Guide, Card, Analog, Left (Pkg. of 10).....	922-1478
Guide, Card, Analog, Right (Pkg. of 10).....	922-1477
Guide, Logic Board, Left (Pkg. of 10).....	922-1186
Guides, Logic Board, Right (Pkg. of 10).....	922-1177
Hard Drive, 250 MB, 3.5", IDE.....	661-0070
Hard Drive, 500 MB, 3.5", IDE.....	661-0146
Housing, Rear, 58x Series.....	922-1615
Housing, Rear, LC 580.....	922-1471
Microphone, Internal.....	922-1802
Mouse II, Apple Desktop Bus, Version A.....	661-0763
Screw, CD-Carrier (Pkg. of 10).....	922-0401
Screw, Net, Sems, M3x.5, Pan Head (Pkg. of 25).....	922-0895
Screw, Sems, M3.5x.6x6.0 (Pkg. of 25).....	922-1203
Screw, Sems, M3, 6x.32, (Pkg. of 25).....	922-1381
Screw, Tap, Flat PAN (Pkg. of 10).....	922-0392
Screw, Tap, Hex, Wash, #8-16.....	922-0069
SIMM, DRAM, 4 MB, 80 ns, 72 pin.....	661-0808
SIMM, DRAM, 8 MB, 80 ns, 72 pin.....	661-0809
Snaps, Bezel (Pkg. of 10).....	922-1462
Speaker.....	922-1472
Washer, Rubber (Pkg. of 25).....	922-1473

## Specifications

**Table 3. Macintosh LC 580/Performa 580CD Specifications**

<b>Processor</b>	Motorola 68LC040 microprocessor; 33 MHz Built-in memory management unit (MMU)
<b>Memory</b>	RAM: 4 MB of dynamic RAM on board; expandable to 52 MB (fast-paced mode 80 ns DRAM SIMMs); two 72-pin SIMM connectors ROM: 1 MB of ROM PRAM: 256 bytes of parameter memory; long-life lithium battery VRAM: 1 MB of DRAM; can display thousands of 16-bit colors
<b>Disk Storage</b>	Floppy Drive: built-in 1.4 MB Apple SuperDrive, manual-inject Hard Drive: internal IDE hard drive CD-ROM Drive: optional internal CD-ROM drive
<b>I/O Interfaces</b>	Serial: two RS-232/RS-422 serial ports for external modem and printer. Modem port uses a 9-pin mini-DIN connector; printer port uses an 8-pin mini-DIN connector SCSI: one SCSI port for expansion. Accommodates up to six external SCSI devices Apple Desktop Bus: one AppleDesktop (ADB) port for keyboard and mouse. Maximum of three ADB devices recommended. Maximum current draw: 500 mA (Mouse draws 10 mA; keyboard draws 25 mA) Sound: sound-input port for monaural sound input; sound-output port capable of delivering 8-bit stereo sound. Stereo headphone jack capable of delivering 8-bit stereo sound Processor-Direct Slot: internal expansion slot for 114-pin processor-direct expansion card Communications Slot: internal expansion slot for optional 112-pin fax modem or Ethernet card Video-In Slot: internal, 60-pin video-in slot for optional expansion card that provides real-time video display, capture, and overlay External Video Connector Slot: one 22-pin connector for a second monitor
<b>I/O Devices</b>	Keyboard: supports all Apple Desktop Bus (ADB) keyboards Mouse: Apple Desktop Bus Mouse II. Mechanical tracking, optical shaft, or contact encoding Microphone: integrated microphone for mono sound input Speaker: integrated stereo speakers capable of delivering 8-bit stereo sound

**Table 3. Macintosh LC 580/Performa 580CD Specifications  
(Continued)**

<b>Sound and Video</b>	<p>Sound Generator: records and plays back at 11 kHz or 22 kHz sample rate. Two speakers with enhanced stereo sound. With optional CD-ROM drive, allows playback of ordinary audio compact discs</p> <p>Video Display: 14-in. diagonal, high-resolution screen (11.5-in. viewable image).</p> <p>External Video Connector (optional) supports video mirroring on the following external monitors (at product introduction):</p> <ul style="list-style-type: none"> <li>• 640 x 480 resolution: Macintosh 12" Color Display, Apple Color Plus 14" Display, Apple Performa Plus Display, Apple Multiple Scan 15 Display, Apple Multiple Scan 17 Display, Apple Multiple Scan 20 Display</li> <li>• 800 x 600 resolution: Apple Multiple Scan 15 Display, Apple Multiple Scan 17 Display, Apple Multiple Scan 20 Display, and SVGA monitors</li> </ul>
<b>Electrical</b>	<p>Power Supply: Voltage: 90 to 264 V rms. Frequency: 50–60 Hz, plus or minus 3 Hz, single phase. Surge Voltage: 300 V rms for 100 ms. Peak Inrush Current: 40 amps pk. Current: 2.0 amps maximum for all line and load conditions. Power: 120 W maximum for all line and load conditions. Line voltage: 100–240 VAC; RMS automatically configured</p> <p>Audio Amplifier: amplifier drives a 16-ohm speaker. Audio Input Voltage: 0.707 V rms. Audio Input Impedance: 10 K ohms. Output Power at 1 kHz: 250 mW. Bandwidth 3 dB: 200 Hz to 15 kHz. Total Harmonic Distortion: ≤ 1%</p>
<b>Physical</b>	<p>Height: 17.9 in. (45.5 cm)</p> <p>Width: 13.5 in. (34.4 cm)</p> <p>Depth: 16.5 in. (42.0 cm)</p> <p>Weight: 40.5 lb. (18.4 kg)</p>
<b>Environmental</b>	<p>Temperature: Operating: 50–104° F (10–40° C). Transit: (72 hours): -40° F to +149° F (-40° C to +65° C). Storage (6 months): -40 to 116.6° F (-40 to 47° C)</p> <p>Relative Humidity: 20–95% noncondensing</p> <p>Operating Altitude: 0–10,000 ft. (0–3,000 m)</p>

---

## Troubleshooting Checklist

Read this checklist before you replace a module. Avoid needless module replacement.

- The CRT raster will not always resemble a perfect rectangle. CRT tolerances allow for some distortion. Magnetized metal objects (desks, file cabinets, etc.) can cause additional distortion. Move the unit to a different location if you notice raster bowing or bent raster edges.
- External interference such as electronic devices and fluorescent lights can cause jitter, faint lines, or screen movement. Move the unit to another room or building to help determine if external interference is the source of the problem.
- A misadjusted screen can mimic the same symptoms as analog-board or CRT failures. By performing the adjustment procedures, you might determine if one or more of the adjustments is the cause of the problem.
- CRTs rarely fail. You can prevent needless CRT replacements by checking the display adjustments, checking the possibility of other defective modules, and by accepting small imperfections in screen display.

If you have any doubts about whether a CRT needs replacement, contact Apple Technical Support.

For more information on general troubleshooting, refer to Chapter 2, General Troubleshooting.

## Symptom/Cure Chart

This Symptom/Cure Chart will help you diagnose specific symptoms related to your product. Because the most likely solution is listed first, try the first-listed solution. Verify whether or not the product continues to exhibit the symptom. If the symptom persists, try the next solution. (Note: If you have replaced a module, reinstall the original module before you proceed to the next solution.)

For additional assistance, contact Apple Technical Support.

### Video

### Solutions

Screen is black, too dark, or too bright; audio and drive operate

- 1 Adjust contrast button on front bezel.
- 2 Adjust brightness button on front bezel.
- 3 Check yoke cable connection.
- 4 Perform video adjustments. Refer to Video Adjustments section.
- 5 Replace analog board.
- 6 Replace CRT.

Screen is bright and audio is present, but no video information is visible

- 1 Perform video adjustments. Refer to Video Adjustments section.
- 2 Replace analog board.

Screen is completely black except for single vertical or horizontal line displayed

- 1 Check yoke cable connection with power off.
- 2 Replace analog board.
- 3 Replace CRT.

Predominant color tint or color cannot be adjusted

Perform video adjustments. Refer to Video Adjustments section.

Picture breaks into diagonal lines, or picture rolls vertically or horizontally

- 1 Perform geometry adjustments. Refer to Video Adjustments section.
- 2 Replace analog board.

Out of convergence (color bleeds from text or lines)

- 1 Perform convergence adjustment. Refer to Video Adjustments section. Note that some misconvergence is normal, especially around edges of screen. Contact Apple Technical Support if you're uncertain whether the misconvergence is within specification.
- 2 Replace analog board.

Black screen spots (burnt phosphors)

Replace CRT.



Screen jitters or flashes	<ol style="list-style-type: none"> <li>1 Refer to "Troubleshooting Checklist" in this chapter. Move electrical devices (other monitors, scanners, etc.) away from monitor. Temporarily shut off all fluorescent lights in area.</li> <li>2 Move unit to another room or building and check if symptom persists.</li> <li>3 Replace analog board.</li> </ol>
Out of focus	<ol style="list-style-type: none"> <li>1 Perform focus adjustment. Refer to Video Adjustments section. Note that misconvergence can also produce an out-of-focus symptom.</li> <li>2 Check for proper screen luminance. If luminance is off, perform cutoff and white balance adjustments. Refer to Video Adjustments section.</li> <li>3 Replace analog board.</li> </ol>
Raster size too short/tall or narrow/wide	<ol style="list-style-type: none"> <li>1 Perform geometry adjustment. Refer to Video Adjustments section.</li> <li>2 Replace analog board.</li> </ol>
Linearity bad (size of text/graphics differs at top, bottom, or sides of screen)	Replace analog board.
Raster tilted or shifted	<ol style="list-style-type: none"> <li>1 Refer to "Troubleshooting Checklist" in this chapter. Move metal objects away from monitor.</li> <li>2 If symptom appears immediately after CRT replacement, reinstall CRT.</li> <li>3 Perform appropriate geometric adjustments. Refer to Video Adjustments section.</li> <li>4 Replace analog board.</li> </ol>
Raster distorted (barrel-shaped, corners not square, stretched or compressed at top of display, or sides not perpendicular)	<ol style="list-style-type: none"> <li>1 Refer to "Troubleshooting Checklist" in this chapter. Move metal objects away from monitor.</li> <li>2 Perform appropriate geometric adjustments. Refer to Video Adjustments section.</li> <li>3 Replace analog board.</li> </ol>
Raster not centered	<ol style="list-style-type: none"> <li>1 Adjust horizontal or vertical shift control. Refer to Video Adjustments section.</li> <li>2 Refer to "Troubleshooting Checklist" in this chapter.</li> </ol>

## Floppy Drive

### Solutions

Audio and video are present, but internal floppy drive does not operate

- 1 Replace bad disk with known-good disk.
- 2 Replace floppy drive.
- 3 Replace logic board. Retain customer's SIMMs.

Disk ejects; display shows icon with blinking "X"

- 1 Replace bad system disk with known-good system disk.
- 2 Replace floppy drive.
- 3 Replace logic board. Retain customer's SIMMs.

Unable to insert disk all the way

- 1 To eject previously inserted disk, insert opened paper clip into hole beside floppy drive.
- 2 Switch off system and hold mouse button down while switching system on (to complete eject cycle).
- 3 Replace floppy drive.

Does not eject disk

- 1 Insert opened paper clip into hole beside floppy drive.
- 2 Switch off system and hold mouse button down while switching system on (to complete eject cycle).
- 3 Replace floppy drive.

Internal floppy drive runs continuously

- 1 Replace bad disk with known-good disk.
- 2 Replace floppy drive.
- 3 Replace logic board. Retain customer's SIMMs.

## Hard Drive

### Solutions

Internal or external hard drive does not operate

- 1 Verify that SCSI loopback card is not attached.
- 2 Verify that external drive is properly terminated.
- 3 Replace hard drive.
- 4 Replace logic board. Retain customer's SIMMs.
- 5 Replace hard drive.

## CD-ROM Drive

### Solutions

CD-ROM drive does not accept disc

- 1 Replace disc (if dirty or damaged).
- 2 Replace CD-ROM drive mechanism.

Volume control does not operate correctly

- 1 Reseat CD adapter connector.
- 2 Replace CD adapter connector.
- 3 Replace CD-ROM drive.
- 4 Replace chassis harness assembly.

Macintosh cannot mount CD-ROM drive

- 1 Reseat CD adapter connector.
- 2 Check SCSI ID setting. (Internal CD-ROM was originally set to 3 at factory.)
- 3 Test CD-ROM drive on known-good Macintosh; if CD-ROM drive doesn't work, replace it.
- 4 Replace chassis harness assembly.

When an internal and external SCSI device are present, only one powers up

- 1 Verify that SCSI device ID switch setting on external device is higher than 0. Verify that ID switch setting on external SCSI device does not duplicate ID switch settings on other external SCSI devices.
- 2 Replace terminator on external SCSI device.
- 3 Replace SCSI select cable.

## Peripheral

Cursor does not move

- 1 Check mouse connection.
- 2 If mouse was connected to keyboard, connect it to rear ADB port instead. If mouse works, replace keyboard. If mouse does not work in any ADB port, replace mouse.
- 3 Replace logic board. Retain customer's SIMMs.

Cursor moves, but clicking mouse button has no effect

- 1 Replace mouse.
- 2 Replace logic board. Retain customer's SIMMs.

Cannot double-click to open application, disk, or server

- 1 Remove extra system files on hard drive.
- 2 Clear parameter RAM. Hold down Shift- Option- P-R keys during system startup but before "Welcome to Macintosh" appears.
- 3 If mouse was connected to keyboard, connect it to rear ADB port instead. If mouse works, replace keyboard.
- 4 If mouse does not work in any ADB port, replace mouse.
- 5 Replace logic board. Retain customer's SIMMs.

No response to any key on keyboard

- 1 Check keyboard connection to ADB port.
- 2 Replace keyboard cable, if detachable.
- 3 Replace keyboard.
- 4 Replace logic board. Retain customer's SIMMs.

## Solutions

Known-good ImageWriter or ImageWriter II does not print

- 1 Make sure that Chooser and Control Panel are set correctly.
- 2 Replace printer driver and system software with known-good.
- 3 Replace printer interface cable.
- 4 Replace logic board. Retain customer's SIMMs.

Known-good LaserWriter does not print

- 1 Make sure that Choose and Control Panel are set correctly.
- 2 Replace printer driver and system software with known-good.

When an internal and external SCSI device are present, only one powers up

- 1 Verify that SCSI device ID switch setting on external device is higher than 0. Verify that ID switch setting on external SCSI device does not duplicate ID switch settings on other external SCSI devices.
- 2 Replace terminator on external SCSI device.
- 3 Replace SCSI select cable.

#### Miscellaneous

Clicking, chirping, or thumping sound

- 1 Replace analog board.
- 2 Replace logic board. Retain customer's SIMMs.

Smoke/odor

Replace analog board.

No video, no audio, and no drive operation

- 1 Connect power cord.
- 2 Switch power on.
- 3 Replace power cord.
- 4 Replace analog board.
- 5 Replace logic board. Retain customer's SIMMs.

"Sad Macintosh" icon

- 1 Replace bad disk with known-good disk.
- 2 Replace RAM SIMMs on logic board.
- 3 Replace logic board. Retain customer's SIMMs.

Screen shows "Sad Macintosh" icon and black vertical lines; screeching sound

- 1 Replace RAM SIMMs on logic board.
- 2 Replace logic board. Retain customer's SIMMs.

Headphone jack does not operate correctly

- 1 Verify that headphone jack is seated properly.
- 2 Replace front panel control board.
- 3 Replace chassis harness assembly.

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Headphone jack does not  
operate correctly

- 1 Verify that headphone jack is seated properly.
- 2 Replace front panel control board.
- 3 Replace chassis harness assembly.

No sound from external  
speakers

- 1 Check that volume is turned on (manually or through Control Panel).
- 2 Verify that headphones are unplugged.
- 3 Verify that speaker connectors are properly connected.
- 4 Test speakers with known-good Macintosh; if speakers do not work, replace them.
- 5 Replace logic board.

Crackling audio

- 1 Verify speaker cables are properly connected.
- 2 Disconnect and reconnect the cables to the speakers.



## Video Adjustments

**▲Warning** This product contains high voltage and a high-vacuum picture tube. To prevent serious injury, review CRT safety in Chapter 1, Safety.

**▲Caution** When placed upright without the rear housing, the front bezel becomes vulnerable to breakage. Avoid overhandling the unit in this condition.

### Cutoff

Perform the cutoff adjustment prior to adjusting the white balance and whenever you replace the CRT or the analog board. Switch on the system at least 10 minutes prior to performing these adjustments.

1. Run Display Service Utility to display the Gray Bars test pattern.
2. Press and hold the upper half of the brightness button until the screen brightness is set to maximum.
3. Using a hex-head plastic adjustment tool, set the SC (sub-contrast) control (see Figure 17) to maximum (turn clockwise).
4. Set the RB (red bias), GB (green bias), and BB (blue bias) controls (see Figure 17) to their minimum (counterclockwise) positions. Setting the bias controls to the minimum causes the three leftmost bars to darken or turn completely black.
5. Adjust the screen control on the flyback transformer very slowly until the third darkest bar from the left is just faintly visible. The screen control is now set correctly and shouldn't have to be readjusted unless inadvertently altered.

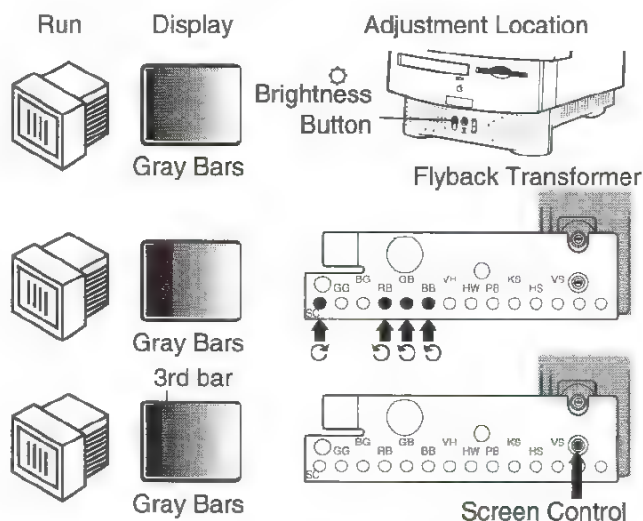


Figure 17. Cutoff Adjustment

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## Geometry Adjustments

The controls on this monitor require a small hex-head plastic tool to make adjustments. If the tool is long, it will be too flexible, which will make fine adjustments difficult. Use a short hex-head plastic tool to minimize flexing. Do not use metal alignment tools — they are a shock hazard. Run Display Service Utility to display the All-White Screen test pattern.

## Centering Adjustments

Using a hex-head plastic adjustment tool, adjust the vertical (VS) and horizontal (HS) controls (See Figure 18) until the raster is centered on the screen.

### Note

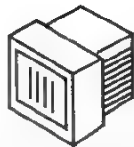
The VS (vertical shift) and HS (horizontal shift) controls on this monitor are also accessible when the rear housing is on.

## Size Adjustments

1. Using a hex-head plastic adjustment tool, adjust the vertical height control (see Figure 18) until the raster height is 7-1/8 inches ( $\pm 1/8$  inch) or 180 mm ( $\pm 2$  mm). Verify this height.
2. Using a hex-head plastic adjustment tool, adjust the horizontal width control (see Figure 18) until the raster width is 9-1/2 inches ( $\pm 1/8$  inch) or 240 mm ( $\pm 2$  mm).

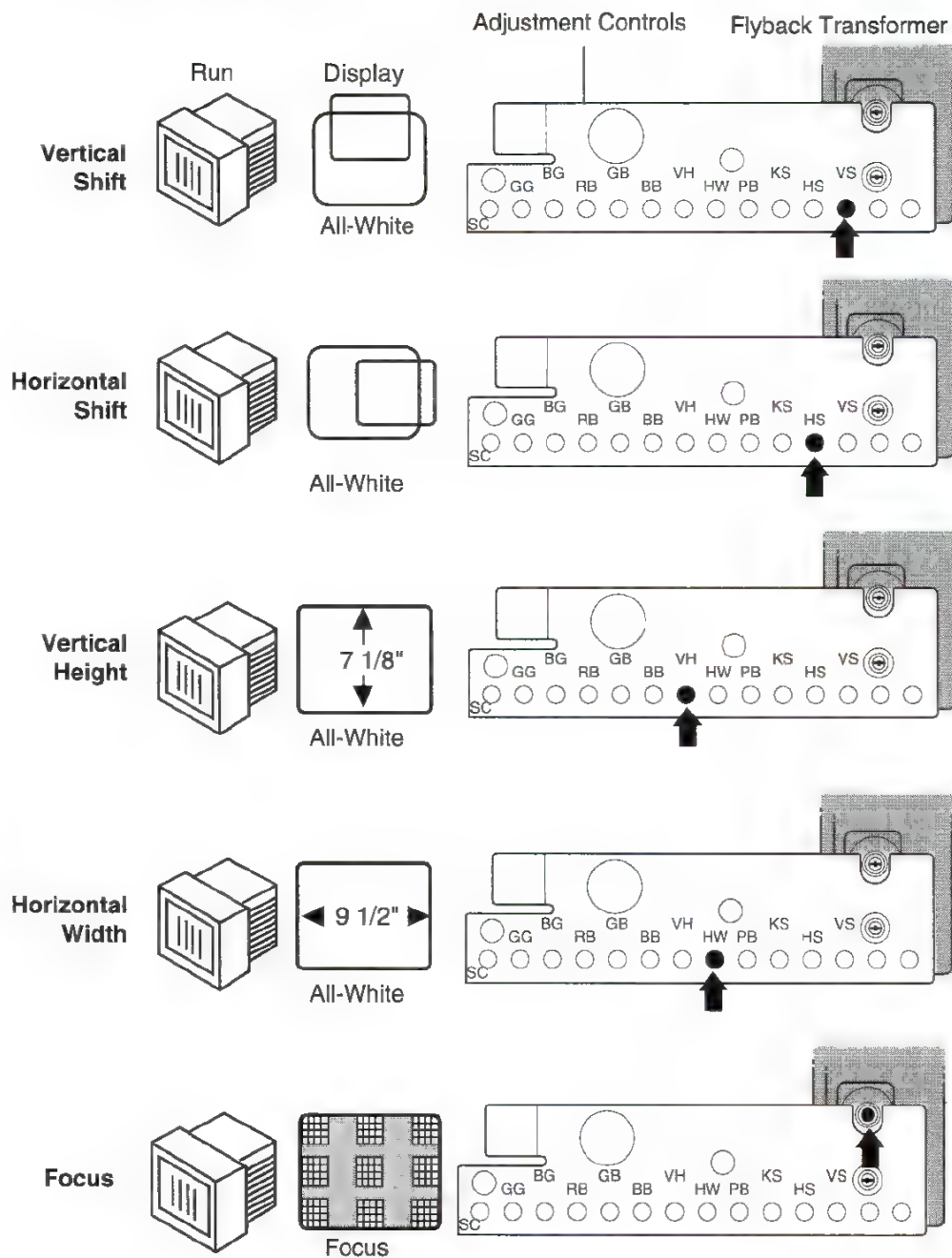
## Focus

1. Run the Display Service Utility to display the Focus test pattern.
2. Adjust the focus control (see Figure 18) on the flyback transformer until the Focus test pattern reaches the best center-of-screen performance.



Use the **Display Service Utility** to display video test patterns and to adjust the geometry of specified Displays.

#### Display Service Utility



**Figure 18. Geometry Adjustments**

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## White Balance

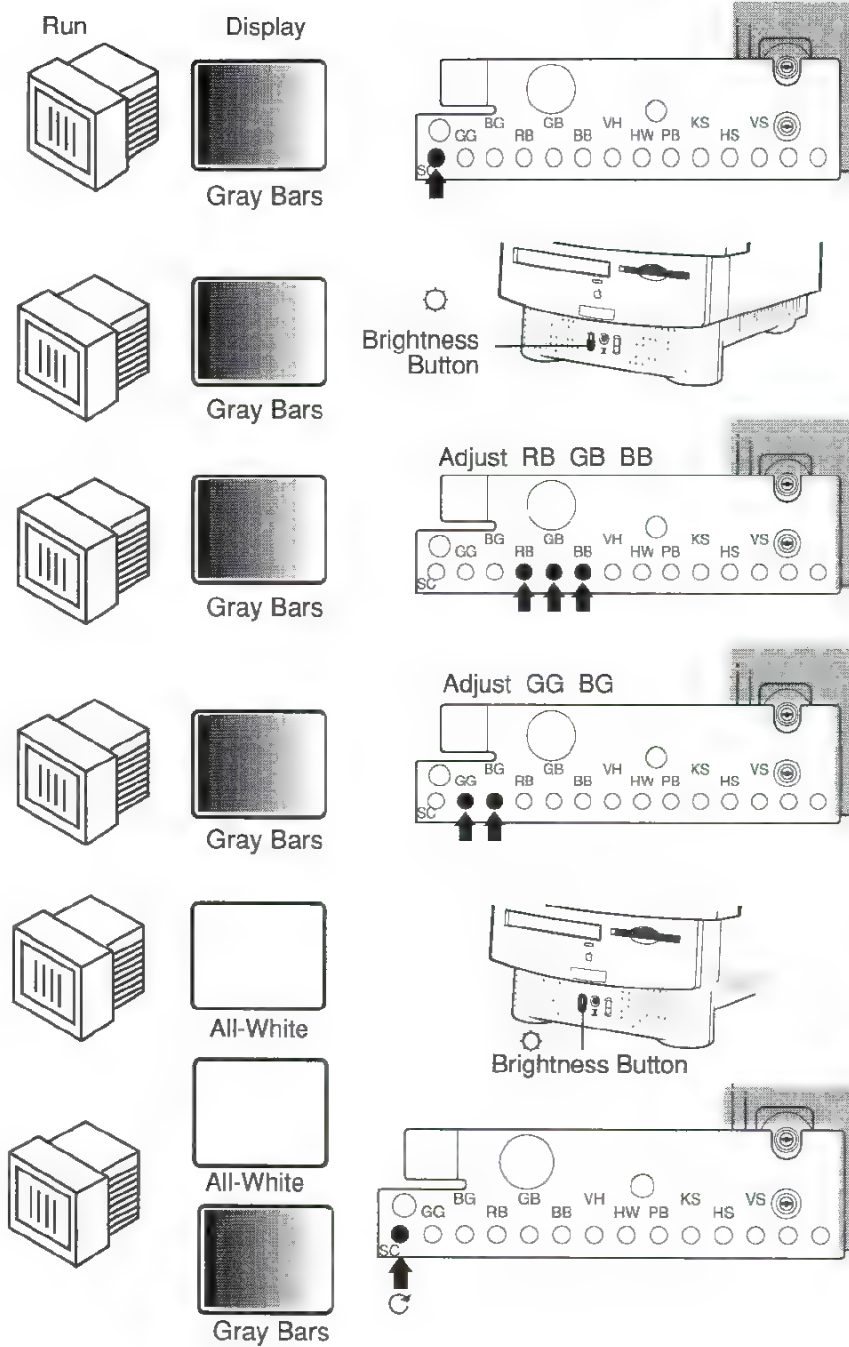
Before adjusting the white balance, perform the cutoff video adjustment and make sure that to:

- Display the Gray Bars test pattern.
- Set the sub-contrast (SC) control to its approximate midpoint.
- Set screen brightness to minimum. (This step causes the screen to darken or turn completely black.)

### Note

As you begin the following adjustments to the bias controls, notice how each control changes its particular hue as well as the screen's overall luminance. Increase any of the bias controls as long as the leftmost (darkest) bar remains completely black. If the screen shows a predominant color, start by adjusting the bias control that will offset that color. Otherwise, start with the GB (green bias) control (see Figure 19).

1. Using a hex-head plastic adjustment tool, alternately adjust the RB (red), GB (green), and BB (blue) bias controls (see Figure 19) until the leftmost bar is black and the eight bars are neutral in color (appear to be shades of gray). The darkest bar must remain completely black throughout the rest of the procedure. If you notice a predominant color in the darkest bar, readjust the appropriate bias control.
2. In most cases the eight bars will appear to be shades of gray. If not, adjust the BG (blue) and GG (green) controls until the color of the eight bars is neutralized.
3. Check to see that there is no predominant color in the eight bars. If there is predominant color, adjust the bias controls until the leftmost bar is black and the other bars display neutral shades of gray.
4. Display the All-White Screen test pattern.
5. Using a light meter against the center of the screen, press the upper half of the brightness button to increase the screen brightness until the screen luminance measures:
  - a. 10 on the 2 through 10 scale of light meter Model L-248
  - b. 24 foot candles on the red scale of light meter Model L-246
  - c. 30 fL (foot lamberts) on a photometer
6. Adjust the SC (sub-contrast) control (turn clockwise) to the correct luminance level (see Figure 19).
7. Check the resulting screen by running Display Service Utility to display the Gray Bars test pattern.



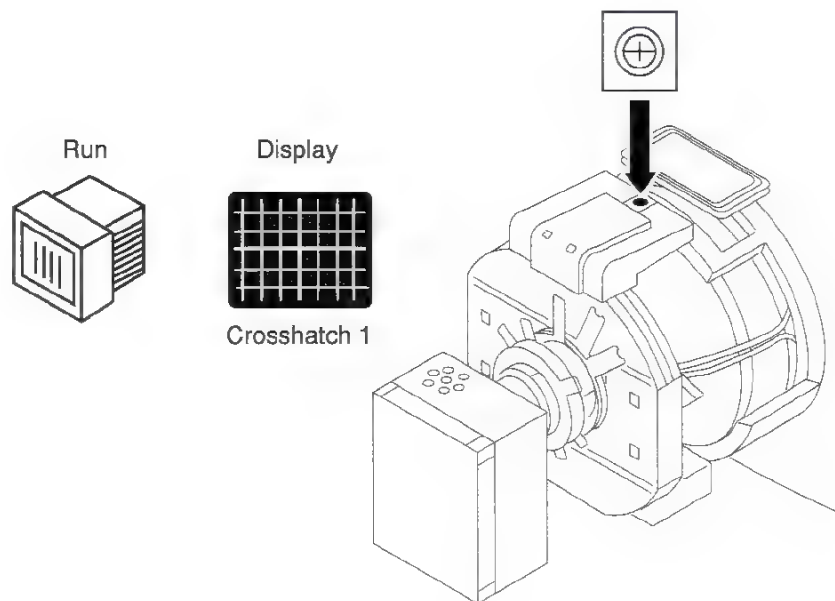
**Figure 19. White Balance Adjustments**



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## Convergence

1. Remove the rear housing.
2. Run Display Service Utility to display the Crosshatch I test pattern.
3. Adjust the convergence control (see Figure 20) for best convergence of the horizontal lines at the top of the screen and the horizontal lines at the bottom of the screen.



**Figure 20. Convergence Adjustment**

## Geometric Distortion

The raster, when adjusted properly, might not appear to be a perfect rectangle. CRT tolerances allow for some raster bowing and unstraight edges.

1. Remove the rear housing.

### ▲Warning

**The entire yoke assembly has very high voltage. To prevent electrical shock, do not touch the yoke assembly, the anode wire, or the yoke wires.**

2. Run Display Service Utility to display the Crosshatch 1 test pattern.
3. To determine which control to adjust, compare the display with the distortions shown in Figure 21.
4. Using a hex-head plastic adjustment tool, adjust the control that is appropriate for the distortion (see Figure 21 for control locations).
5. If the display is so distorted that you can't tell which adjustments to make, perform the adjustments in the following sequence:
  - a. KS (Keystone)
  - b. Trapezoid (last unlabeled opening)
  - c. PB (Horizontal Bow)
6. If the display is still distorted, repeat all three adjustments.

Some geometric distortion is normal. However, if you can't correct the distortion, replace the analog board.

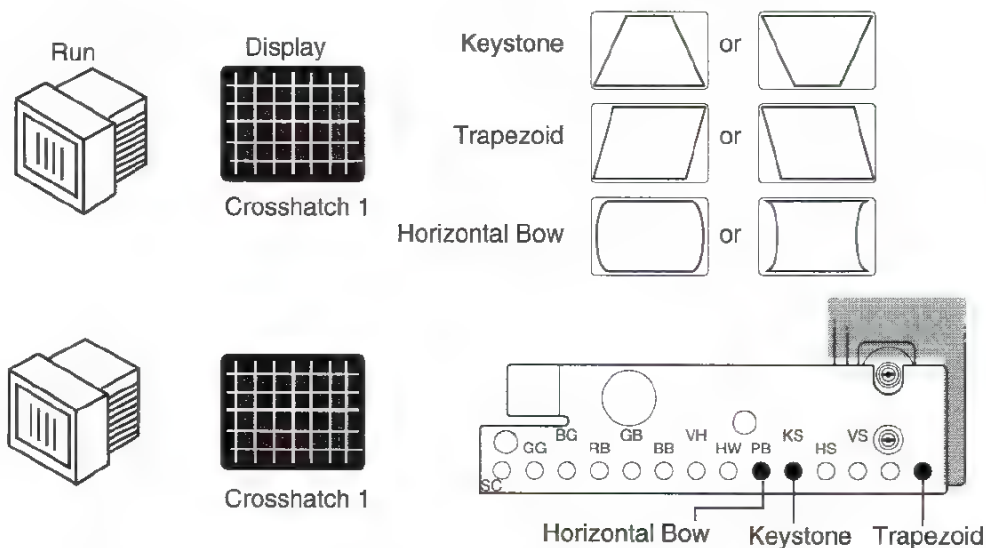


Figure 21. Geometric Distortion Adjustment

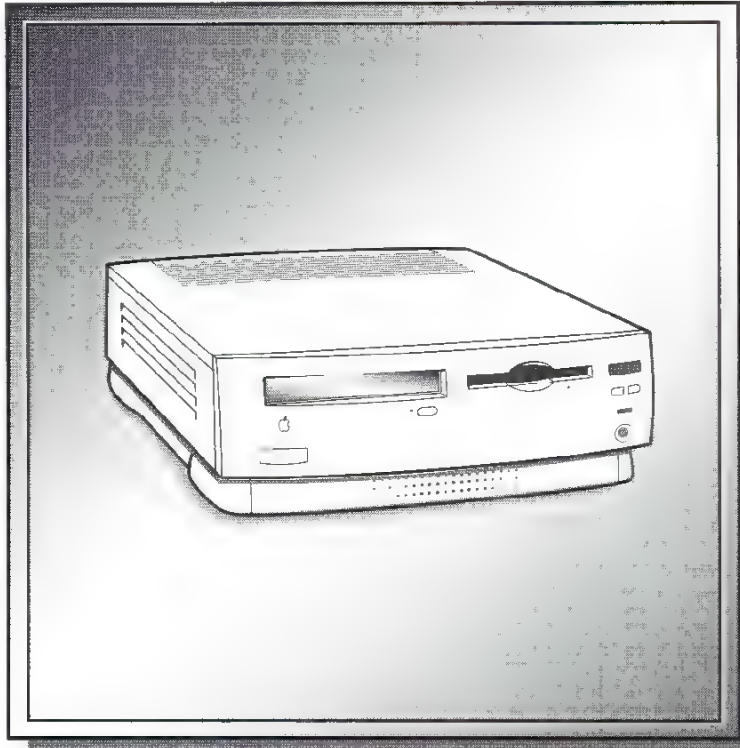


# LC/Performa/Quadra 630 Series

## LC 630 DOS-Compatible

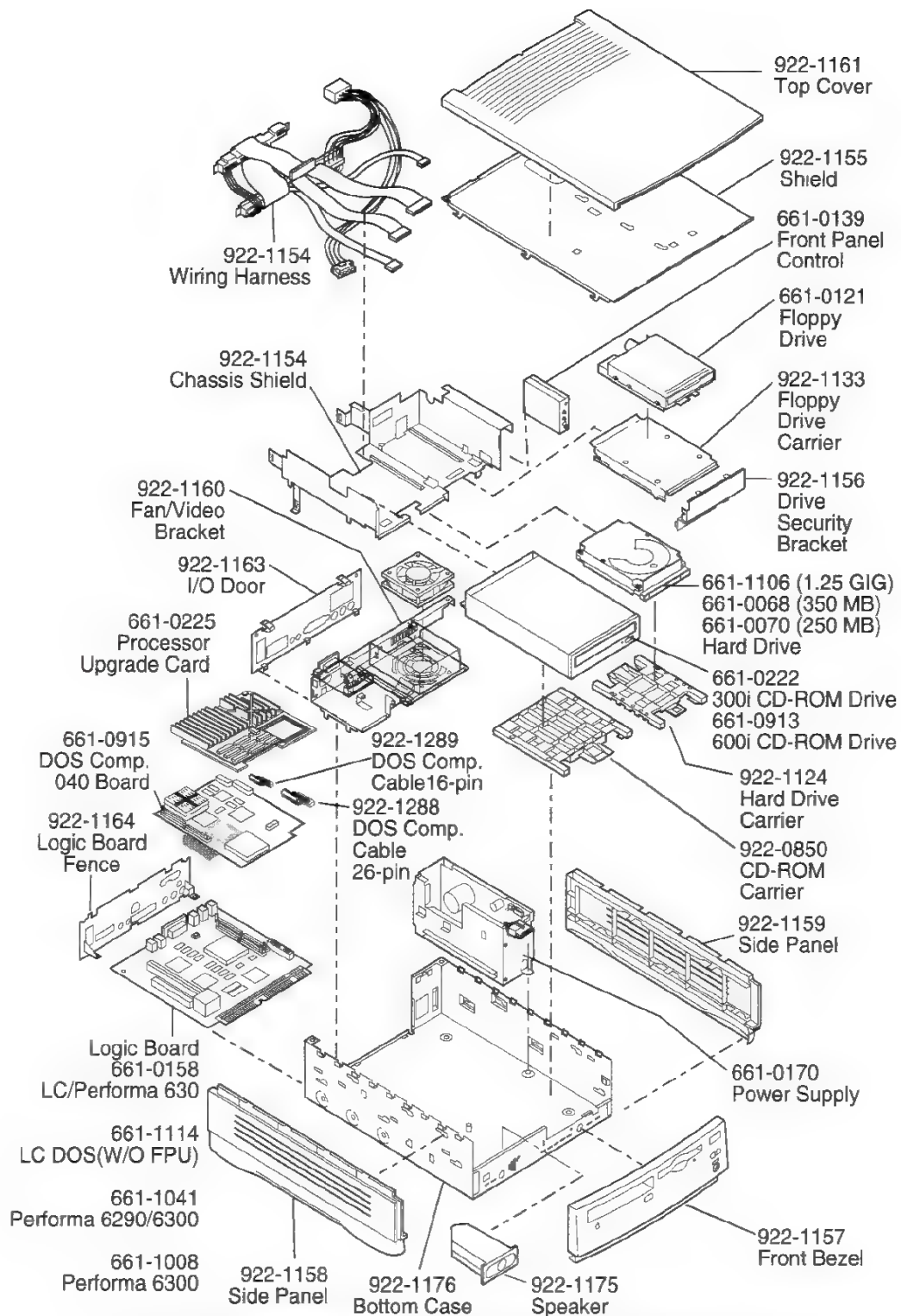
## Performa 640 DOS-Compatible

## Performa 6200/6300 Series



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## Exploded View



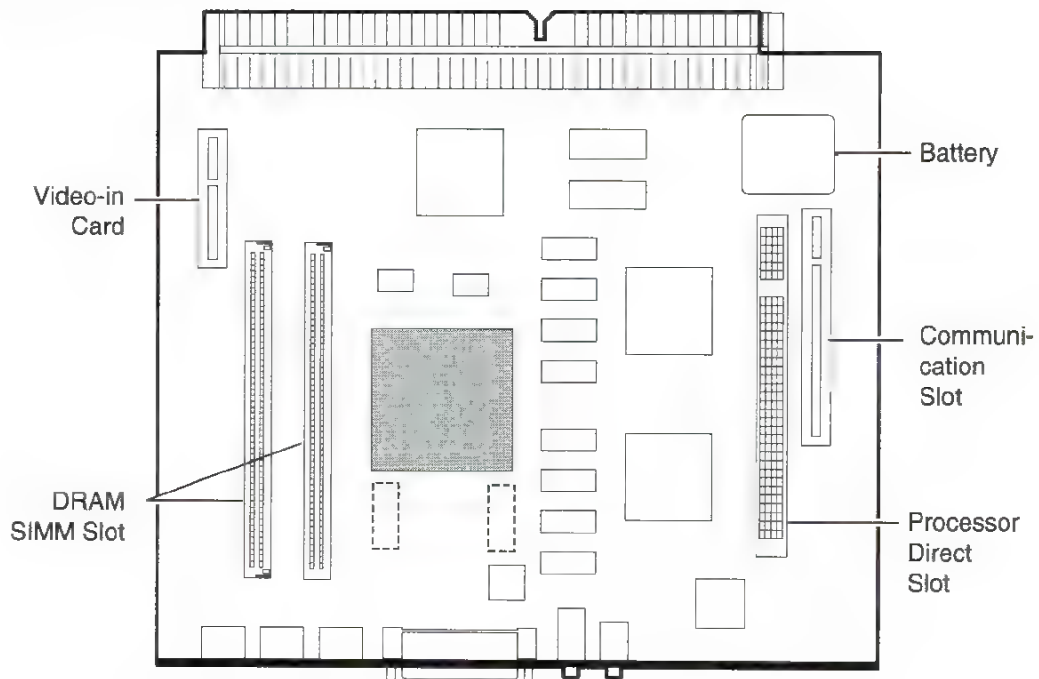
*This is a generic representation of a product family. Configurations may vary.*

**Figure 22. LC/Quadra/Performa 630/640/6200/6300 Exploded View**

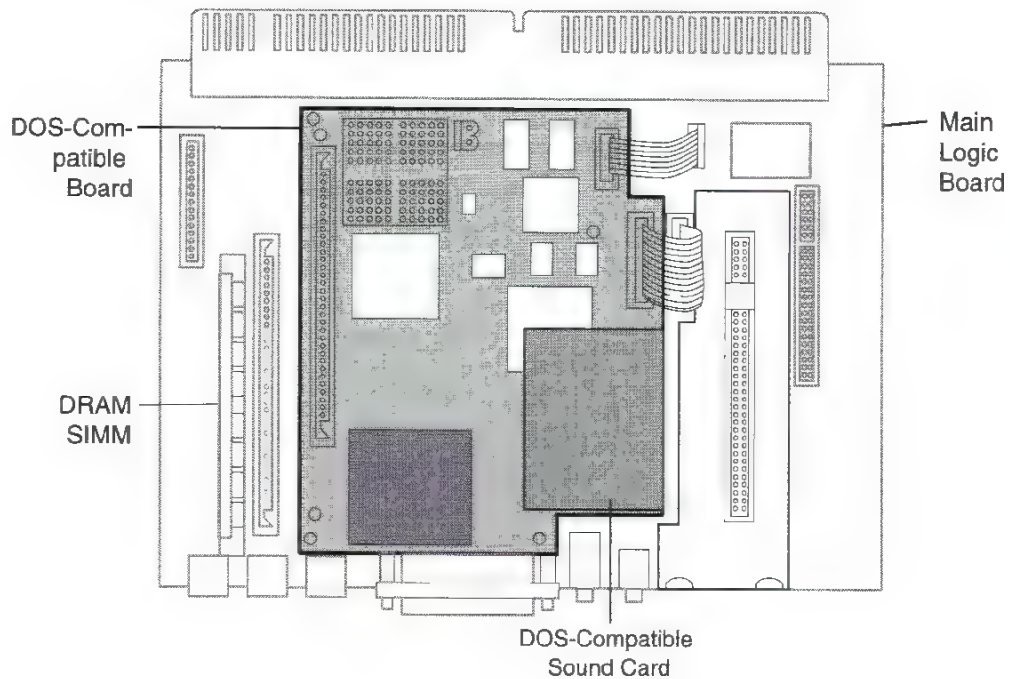


## LC/Performa 630, 640 Logic and DOS-Compatible Boards

### LC630 Logic Board



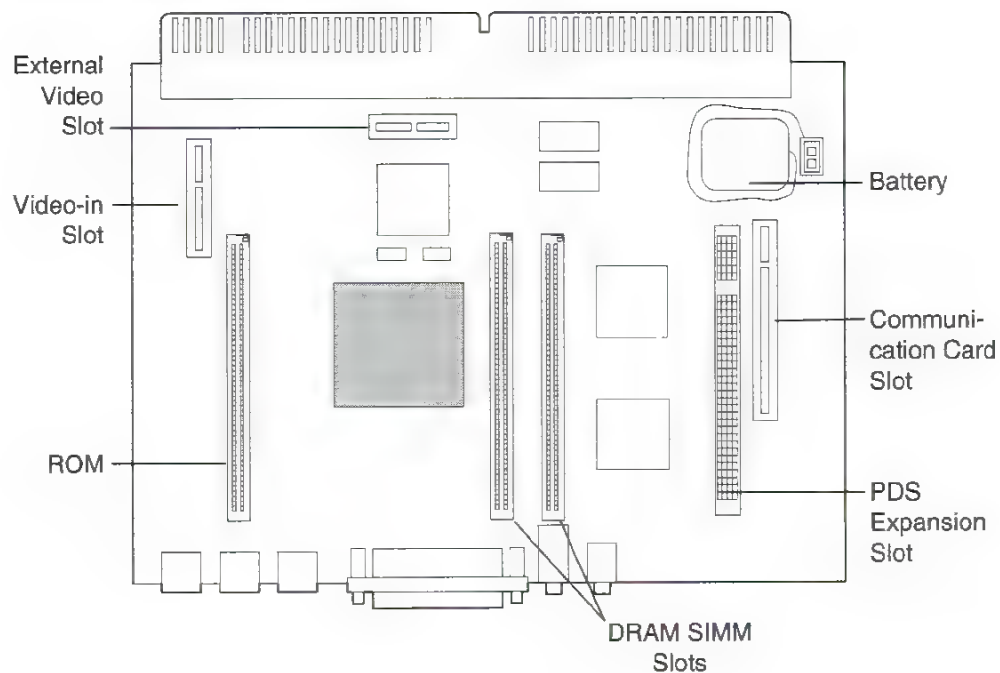
### LC640 Logic Board with DOS-Compatible Board and Sound Card



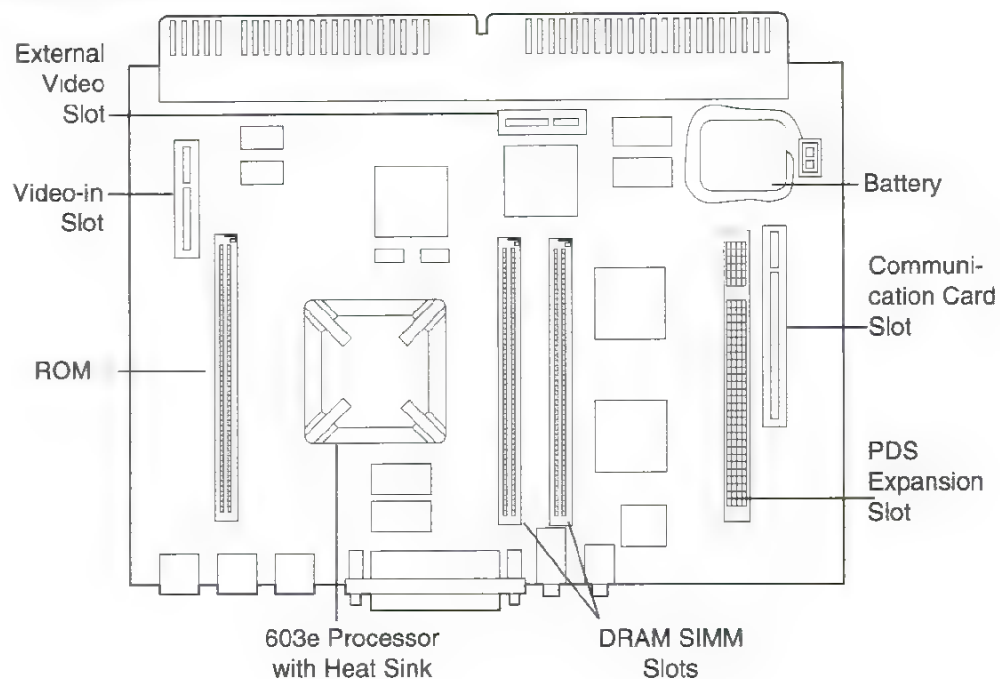
**Figure 23. LC 630/640 Logic and DOS-Compatible Boards**

## Performa 6200 and 6300 Logic Boards

### Performa 6200 Logic Board



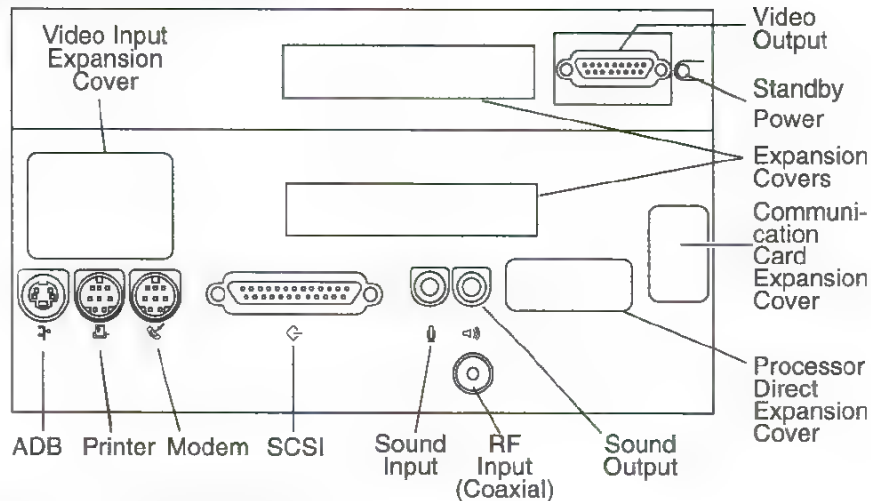
### Performa 6300 Logic Board



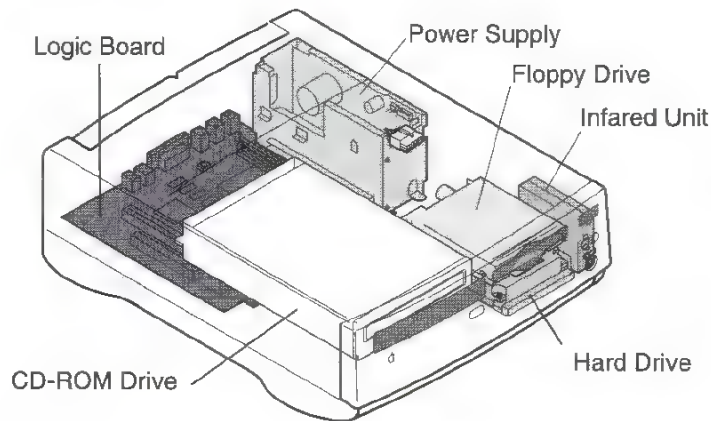
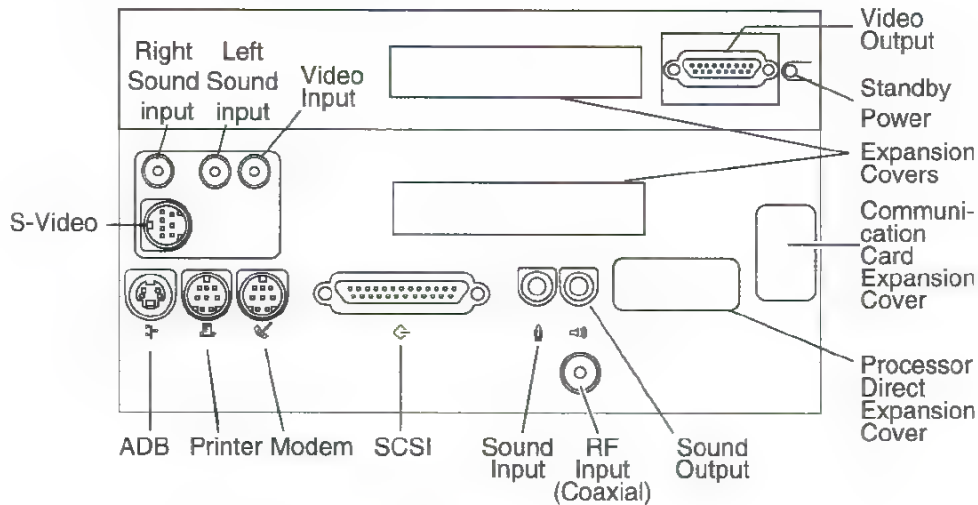
**Figure 24. Performa 6200/6300 Logic Boards**

## Back Panel and Locator Views

### Back Panel 630/640 Series



### Back Panel 6200/6300 Series



**Figure 25. LC/Quadra/Performa 630/640/6200/6300 Back Panel and Locator Views**

## Parts List

Apple Keyboard II .....	661-0603
Assy, Ethernet LC Card, Standoffs, 10 sets .....	076-0543
Battery, Alk., 4.5 V, Velcro Mount .....	922-0750
Bezel, Front, DOS Compatible .....	922-1508
Bezel, Front .....	922-1157
Board, DOS Compatible, 68LC040 .....	661-0915
Board, DOS Compatible, with FPU .....	661-0767
Board, Front Panel Control .....	661-0139
Board, Logic, 4 MB, with FPU .....	661-0236
Board, Logic, 4 MB, without FPU, DOS Compatible (Replaces 661-0234) .....	661-1114
Board, Logic, 68LC040/33 with External Video Out, without FPU (Replaced by 661-1114) .....	661-0234
Board, Logic, Quadra 630, 4 MB .....	661-0189
Board, Logic, LC 630, Performa 630 Series .....	661-0158
Board, Logic, Performa 6200/6300, 603/75 MHz, 16-Bit .....	661-1008
Board, Logic, Performa 6200/6300, 603E/100 MHz .....	661-1041
Board, Sound, DOS Compatibility .....	661-0253
Bottom Case and Shield .....	922-1176
Bracket, Fan/Video .....	922-1160
Cable, DOS Compatible, 16 pin (Pkg. of 5) .....	922-1289
Cable, DOS Compatible, 26 pin (Pkg. of 5) .....	922-1288
Cable, MPEG Board (Pkg. of 5) .....	922-1568
Card, Adapter, DOS Compatible .....	922-1366
Card, Ethernet, 10 Base-T, Comm Slot .....	661-0888
Card, Ethernet, AAUI Port, Comm Slot .....	661-0889
Card, Internal Modem, 14.4 .....	661-1048
Card, Internal Modem, 28.8 .....	661-1078
Card, Macintosh Processor Upgrade w/256K Cache .....	661-0255
Card, MPEG Media System .....	661-0995
Card, TV Tuner .....	661-0160
Card, Video-In (Rev. A) (Replaced by 661-1073) .....	661-0159
Card, Video-In (Rev. B) (Replaces 661-0159) .....	661-1073
Carrier, CD-ROM Drive .....	922-0850
Carrier, Floppy Drive .....	922-1133
Carrier, Hard Drive .....	922-1124
CD Audio Connector (Use with 661-0222) .....	922-0766
CD-ROM Drive, Apple CD 300+, Trayloading .....	661-0222
CD-ROM Drive, AppleCD 600i .....	661-0913
CD/HD Connector, Adapter .....	922-1820
Chassis, Shield/Wiring Harness .....	922-1154
Clip, Ground, Logic Board (Pkg. of 25) .....	922-1279
Cover Plate, Rear, Plastic .....	922-1178



Cover, Top, Plastic .....	922-1161
Drive Front Security Bracket .....	922-1156
Extended Keyboard, Captive Cable ADB .....	661-0310
Fan/Video Card Bracket .....	922-1160
Fastener, Hook and Loop, Macintosh Processor Upgrade .....	922-1264
Fence, Logic Board .....	922-1164
Fence, Logic Board .....	922-1567
Floppy Drive, Apple SuperDrive, 1.4 MB, Manual Insert .....	661-0121
Foot, Platinum .....	865-0051
Guide, Logic Board, Left (Pkg. of 10) .....	922-1186
Guide, Logic Board, Right (Pkg. of 10) .....	922-1177
Hard Drive, 250 MB, 3.5", IDE .....	661-0070
Hard Drive, 350 MB, 3.5", IDE .....	661-0068
Hard Drive, 500 MB, 3.5", IDE (Replaced by 661-0146) .....	661-0086
Hard Drive, 500 MB, 3.5", IDE .....	661-0146
Hard Drive, 1.2 GB, 3.5", IDE .....	661-1106
Hard Drive, 1 GB, 3.5", IDE .....	661-0955
I/O Door, Plastic .....	922-1163
I/R Remote Control .....	922-0549
Keyboard, Apple Adjustable .....	661-0731
Keyboard, Apple Extended (Replaced by 661-0543) .....	661-0384
Keyboard, Apple Extended II .....	661-0543
Keyboard, Apple Desktop Bus (Replaced by 661-0603) .....	661-0337
Keyboard, AppleDesign .....	661-0310
Keypad, Apple Adjustable .....	661-0762
Keypad, Apple Adjustable Int'l, w/Decimal Point (,) .....	661-0816
Keypad, Apple Adjustable Int'l, w/Decimal Point (.) .....	661-0817
Label, Product ID, Performa 640 with DOS (Pkg. of 25) .....	922-1484
Label, Product ID, Quadra 630 (Pkg. of 10) .....	922-1152
Label, Product ID, LC 630 & LC 630 DOS Comp. (Pkg. of 10) .....	922-1132
Label, Product ID, Performa 630 w/CD .....	922-1173
Label, Product ID, Performa 630 .....	922-1172
Label, Product ID, Performa 631CD (Pkg. of 25) .....	922-1741
Label, Product ID, Performa 635 w/CD .....	922-1174
Label, Product ID, Performa 636 (Pkg. of 10) .....	922-1169
Label, Product ID, Performa 636 w/CD (Pkg. of 10) .....	922-1170
Label, Product ID, Performa 637 w/CD (Pkg. of 10) .....	922-1211
Label, Product ID, Performa 638 w/CD (Pkg. of 10) .....	922-1171
Label, Product ID, Performa 6200 (Pkg of 25) .....	922-1510
Label, Product ID, Performa 6216CD (Pkg of 25) .....	922-1727
Label, Product ID, Performa 6218CD (Pkg of 25) .....	922-1728
Label, Product ID, Performa 6220CD (Pkg of 25) .....	922-1726
Label, Product ID, Performa 6230CD (Pkg of 25) .....	922-1725



Label, Product ID, P6300CD (Pkg. of 10) .....	922-1897
Microphone, Apple PlainTalk .....	922-0867
Mouse II, Apple Desktop Bus, Version A .....	661-0763
Mouse II, Apple Desktop Bus, Version B .....	661-0104
Mouse, Apple DeskTop Bus (Replaced by 661-0763) .....	661-0338
Mouse, Apple Desktop Bus (Replaced by 661-0763) .....	661-0479
Nut, Jac-D Sub Conn (Pkg. of 15) .....	922-1287
Plastic Top Cover .....	922-1161
Plug, Bezel, CD Slot (Pkg. of 10) .....	922-1184
Plug, Tune, without Hole (Pkg. of 10) .....	922-1213
Plus Display, 14" Color Monitor, .29 Dot .....	661-1669
Power Cord, 110 V, Smoke .....	590-0380
Power Supply .....	661-0170
Rear Panel, Plastic .....	922-1162
Remote Control .....	922-1201
Right Guide .....	922-1177
Screw, CR REC PAN M3x.5x6 .....	922-0979
Screw, M3x6mm, Mach .....	416-1306
Screw, M3x8mm, Pan Head, Philips (Pkg. of 10) .....	922-0401
Screw, Net, Sems, M3x.5, Pan Head (Pkg. of 25) .....	922-0895
Screw, Sems, 6-32x.313 CRS .....	440-6105
Screw, Sems, M3.5x.6x6 .....	462-4101
Screw, Sems, M3.5x.6x6.0 (Pkg of 25) .....	922-1203
Screw, Torx, External 800K Drive .....	416-1305
Shield, Top Cover .....	922-1155
Side Panel, Left, Plastic .....	922-1158
Side Panel, Right, Plastic .....	922-1159
SIMM, 1 MB, 80 ns .....	661-0734
SIMM, DRAM, 16 MB, 80 ns, 72 pin .....	661-0087
SIMM, DRAM, 4 MB, 80 ns, 72 pin .....	661-0808
SIMM, DRAM, 8 MB, 80 ns, 72 pin .....	661-0809
SIMM, DRAM, 16 MB, 80 ns, 72 pin .....	661-0087
Speaker .....	922-1175
Standoff, M3, Hex, 10 mm (Pkg. of 25) .....	922-1286
Standoff, M3, Hex, 11 mm (Pkg. of 25) .....	922-1240

## Specifications

**Table 4. 630 Series, 640/DOS Compatible, 6200/6300 Series**

<b>Processor</b>	<p>LC 630/Performa 630 Series: Motorola 68LC040 microprocessor; 33 MHz</p> <p>Quadra 630: Motorola 68040 microprocessor; 33 MHz</p> <p>LC 630 DOS-Compatible/Performa 640 DOS-Compatible: Motorola 68040, 33 MHz; DOS Compatible Card with a 66 MHz 80486DX2 processor</p> <p>Performa 6200–6230: PowerPC 603 processor; 75 MHz</p> <p>Performa 6290: Power PC 603 processor; 100 MHz</p> <p>Performa 6300: PowerPC 603e processor; 100 MHz</p> <p>Addressing: 32-bit internal registers, address bus, and data bus (Performa 630 series); 64-bit PowerPC bus (6200/6300)</p>
<b>Memory</b>	<p>DRAM: 4 MB built in, expandable to 36 MB; 2-pin, 80 ns or faster SIMMs (630 Series); 1 or 2 DRAM SIMM slots (6200/6300); 8 MB on main logic board, 4 MB built in and 4 MB DRAM SIMM in one slot (LC 630 DOS-Compatible), maximum addressable memory is 52 MB on the main logic board (4 MB built in, 32 MB SIMM in one slot and 16 MB SIMM the second slot); 4 MB SIMM, maximum addressable memory is 32 MB (DOS-Compatible board), main logic board and DOS Compatible board require 72-pin, 80 ns or faster SIMMs; 8 MB DRAM, minimum, in one SIMM slot, expandable to 64 MB in two SIMM slots, 72-pin, 80 ns or faster SIMMs, (Performa 6200/6300)</p> <p>DRAM Frame Buffer: 1 MB DRAM on board, for video support</p> <p>ROM: 1 MB (Performa 630 Series); 4 MB (Performa 6200/6300)</p> <p>Cache Memory: 256K level two (Performa 6200/6300)</p>
<b>Disk Storage</b>	<p>Floppy Drive: 1.4 MB Apple SuperDrive Manual Insert Drive</p> <p>CD-ROM Drive: Optional Apple 300i Plus (630 Series); Optional Apple 600i (Performa 6200/6300)</p> <p>Hard Drive: 250 MB or 350 MB IDE hard drive (630 series); 500 MB IDE hard drive (LC 630 DOS-Compatible); 250 MB IDE hard drive (Performa 630 Series); 1 GB IDE (Performa 6200), 1.2 GB IDE (Performa 6290/6300)</p>
<b>I/O Devices</b>	<p>Keyboard: Apple Extended Keyboard II (other ADB keyboards supported)</p> <p>Mouse: ADB Mouse II</p> <p>Microphone: Electret, omnidirectional (Performa 630 series); Integrated microphone for monophonic sound input (Performa 6200/6300)</p> <p>Speaker: Integrated stereo speakers capable of delivering 16-bit stereo sound (Performa 6200/6300)</p>

**Table 4. 630 Series, 640/DOS Compatible, 6200/6300 Series  
(Continued)**

<b>I/O Interfaces</b>	<p>Serial: Two RS-232/422 serial ports; mini DIN-8 connectors</p> <p>SCSI: One external SCSI port; DB-25 connector, supports up to six SCSI devices</p> <p>Apple Desktop Bus: One Apple Desktop Bus (ADB) port; mini DIN-4 connector</p> <p>Sound Input: Built-in microphone for monophonic sound input, sound-input port for microphone or line input. (The port accepts stereophonic input, but sound is combined into monophonic sound for play-through or recording.)</p> <p>Sound Output: Two stereophonic sound output ports, level nominally 0.5 V RMS into 39 ohms (one front headphone jack, one rear stereo mini phone jack), internal stereo speakers</p> <p>External Video Connector: One DB-15 monitor port on built-in video daughterboard (630 Series); One DB-15 mirror video-out connector using optional video connector kit; this feature provides "mirroring" (or display of the system monitor screen on a presentation screen) (Performa 6200/6300) The external video display is presentation only. It can not be manipulated directly by mouse or other input signals.</p> <p>Video-in Slot: One 60-pin video-in slot for optional expansion card providing real-time video display, capture, and overlay</p> <p>TV Tuner: One 10 pin port for optional TV tuner card</p> <p>Processor-Direct Slot (PDS): One 96/114-pin internal expansion slot for LC-compatible processor-direct card; an adapter board occupies the LC processor-direct slot, providing a DB-15 connector for a PC/AT game controller (LC 630 DOS Compatible)</p> <p>Communication Slot: One 112-pin internal expansion slot for modem or Ethernet card</p> <p>Controls: Soft power-on control from keyboard, Front panel pushbutton control for sound volume, infrared remote control</p>
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**Table 4. 630 Series, 640/DOS Compatible, 6200/6300 Series  
(Continued)**

<b>Sound and Video</b>	<p>Sound : 8-bit monophonic sound input, 8-bit stereo sound output (630 Series); Records at 11 kHz or 22 Hz sample rate, plays back at 22 kHz sample rate, two speakers with enhanced stereo sound allows playback and recording of ordinary audio compact discs, 16-bit monophonic sound input, 16-bit stereophonic sound output (16-bit CD stereophonic playback), level nominally 0.5 V RMS into 39 ohms, sound-input port for microphone or line input; accepts stereophonic input, but sound is combined into monophonic sound for play-through or recording, two stereophonic sound output ports, level nominally 0.5 V RMS into 39 ohms, internal speaker muted when a plug is inserted into an output jack. (Performa 6200/6300)</p> <p>Video Screen: 15-inch 0.28 mm dot-pitch cathode-ray tube (CRT)</p> <p>Video Resolution: 640 by 480 resolution with 16-bit color at 67 Hz or 60 Hz (VGA), 800 by 600 resolution with 8-bit color at 60 Hz or 72 Hz (VGA), 832 by 624 resolution with 8-bit color at 75 Hz (does not support video input)</p> <p>Video Mirroring: With the external video connector kit, the Macintosh Performa 6200CD series supports video mirroring on these monitors:</p> <ul style="list-style-type: none"> <li>• 640 by 480 resolution: Macintosh 12" Color Display, Apple Color Plus 14" Display, Apple Performa Plus Display, Apple Multiple Scan 15 Display, Apple Multiple Scan 17 Display, and Apple Multiple Scan 20 Display</li> <li>• 800 by 600 resolution: Apple Multiple Scan 15 Display, Apple Multiple Scan 17 Display, Apple Multiple Scan 20 Display, and SVGA monitors</li> </ul>
<b>Electrical</b>	<p>Line Voltage: 100–240 VAC</p> <p>Frequency: 47–63 Hz</p> <p>Power : 45 W, not including monitor (630 Series); 125 watts, surge voltage: 300 V RMS for 100 ms, peak inrush current: 40 A pk; current: 2.5 A maximum for all line and load conditions, power: 220 W maximum for all line and load conditions (Performa 6200/6300)</p>
<b>Physical</b>	<p>Height: 4.3 in. (10.95 cm)</p> <p>Width: 16.5 in. (41.95 cm)</p> <p>Depth: 12.6 in. (32 cm)</p> <p>Weight: Without CD-ROM: 17 lb. (7.7 kg); with CD-ROM: 19 lb. (8.6 kg), weight varies with options</p>



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## Symptom/Cure Chart

This Symptom/Cure Chart will help you diagnose specific symptoms related to your product. Because the most likely solution is listed first, try the first-listed solution. Verify whether or not the product continues to exhibit the symptom. If the symptom persists, try the next solution. (Note: If you have replaced a module, reinstall the original module before you proceed to the next solution.)

For additional assistance, contact Apple Technical Support.

### Error Chords

### Solutions

Eight-tone error chord sounds during startup

- 1 Reseat SIMMs.
- 2 Replace SIMMs.
- 3 Replace logic board. Retain customer's SIMMs.
- 4 Perform SIMM verification on replacement logic board.

Four-tone error chord sounds during startup

- 1 Check CD-ROM drive for disc. If disc is present, remove and reboot computer.
- 2 Disconnect hard drive power cable and reboot system. If startup sequence is normal, run "Macintosh Hard Disk Test" and replace hard drive if necessary.
- 3 Disconnect floppy drive cable and reboot system. If startup sequence is normal, replace floppy drive.
- 4 Replace logic board. Retain customer's SIMMs.

### Built-in Video

### Solutions

Screen is dark, audio and at least one drive operate, fan runs, and LED is lit

- 1 Confirm that video connections are secure.
- 2 Confirm that monitor-out daughterboard connection on the fan bracket is secure.
- 3 Reseat logic board.
- 4 Perform monitor adjustments
- 5 Replace monitor.
- 6 Replace logic board. Retain customer's SIMMs.
- 7 Replace power supply.

Screen is dark, audio and drive do not operate, but fan runs and LED is lit

- 1 Reseat logic board.
- 2 Remove expansion card, if present.
- 3 Remove peripherals.
- 4 Replace SIMMs.
- 5 Replace logic board. Retain customer's SIMMs.
- 6 Replace power supply.



Partial or whole screen is bright and audio is present, but no video information is visible

- 1 Reseat logic board.
- 2 Replace fan/video card bracket.
- 3 Replace monitor.
- 4 Replace logic board. Retain customer's SIMMs.

Screen is completely dark, fan is not running and LED is not lit

- 1 Check all external power connections.
- 2 Computer powers on exclusively through softpower on keyboard. Verify that power-on connections of keyboard are functioning by testing with known-good keyboard.
- 3 Reseat logic board.
- 4 Unplug 5.4 battery, wait 20 seconds, plug in battery, and restart computer.
- 5 Verify that monitor has power.
- 6 Remove expansion card, if present.
- 7 Remove peripherals.
- 8 Replace power supply.
- 9 Replace logic board. Retain customer's SIMMs.

Vertical lines, horizontal lines, or snow appears on screen, or screen is completely dark; startup tone is normal

- 1 Perform monitor adjustments.
- 2 Replace monitor.
- 3 Replace logic board. Retain customer's SIMMs.
- 4 Replace power supply.

## Floppy Drive

Audio and video are present, but internal drive does not operate

## Solutions

- 1 Reseat logic board.
- 2 Replace floppy drive.
- 3 Replace shield/wiring harness.
- 4 Replace logic board. Retain customer's SIMMs.

Disk ejects; display shows Mac icon with blinking "X"

- 1 Replace disk with known-good system disk.
- 2 Replace floppy drive cable.
- 3 Replace floppy drive.
- 4 Replace logic board. Retain customer's SIMMs.

Disk does not eject

- 1 Switch off system and hold mouse button down while switching system back on.
- 2 Eject disk manually by pushing opened paper clip into hole beside drive slot.
- 3 Replace floppy drive cable.
- 4 Replace floppy drive.

Drive attempts to eject disk, but doesn't

- 1 Switch off system and hold mouse button down while switching system back on.
- 2 Eject disk manually by pushing opened paper clip into hole beside drive slot.
- 3 Replace floppy drive cable.
- 4 Replace floppy drive.

### Hard Drive

Internal hard drive runs continuously

#### Solutions

- 1 Make sure System is version 7.1.2 (or later).
- 2 Replace hard drive cable.
- 3 Replace internal hard drive.
- 4 Replace logic board. Retain customer's SIMMs.

Internal hard drive does not operate

- 1 Confirm that all hard drive connections are secure.
- 2 Reseat logic board.
- 3 Replace internal IDE hard drive.
- 4 Replace shield/wiring harness chassis.
- 5 Replace logic board. Retain customer's SIMMs.

### CD-ROM Drive

CD-ROM drive does not accept disc

#### Solutions

- 1 Replace disc (if dirty or damaged).
- 2 Reseat CD-ROM drive.
- 3 Replace CD-ROM drive.

Volume control does not operate correctly

- 1 Check Control Panel Sound setting.
- 2 Check front panel controls.
- 3 Replace shield/wiring harness chassis.

Macintosh cannot mount CD-ROM drive

- 1 Verify CD-ROM software drivers are install and haven't been disabled.
- 2 Reseat CD-ROM drive.
- 3 Check SCSI ID setting; internal CD-ROM drive was originally set at 3 at the factory.
- 4 Replace CD-ROM drive.

### Peripheral

Works with internal or external SCSI device but does not work with both

#### Solutions

- 1 Verify that SCSI select switch on external device is set to different priority from internal CD-ROM drive.
- 2 Verify that both ends of external SCSI device are terminated.

	3	Replace terminator on external device.
	4	Verify that terminator is installed on internal SCSI drive.
	5	Replace SCSI select cable (on external SCSI device).
Cursor does not move	1	Check mouse connection.
	2	If mouse was connected to keyboard, connect mouse to rear ADB port and disconnect keyboard. If mouse works, replace keyboard. If mouse does not work in ADB port, replace mouse.
	3	Reseat logic board.
	4	Replace logic board. Retain customer's SIMMs.
Cursor moves, but clicking mouse button has no effect	1	Replace mouse.
	2	Reseat logic board.
	3	Replace logic board. Retain customer's SIMMs.
Double-click doesn't open application, disk, or server	1	Remove extra system files on hard drive.
	2	Check mouse speed on Control Panel
	3	Unplug 5.4 battery, wait 20 seconds, plug in battery, and restart computer.
	4	If mouse was connected to keyboard, connect mouse to rear ADB port and disconnect keyboard. If mouse works, replace keyboard. If mouse does not work in ADB port, replace mouse.
	5	Replace logic board. Retain customer's SIMMs.
No response to any key on keyboard	1	Make sure System is version 7.1.2 (or later).
	2	Check keyboard connection to ADB port.
	3	Replace keyboard.
	4	Reseat logic board.
	5	Replace logic board. Retain customer's SIMMs.
Known-good ImageWriter or ImageWriter II does not print	1	Make sure that Chooser and Control Panel settings are correct.
	2	Make sure System is version 7.1.2 (or later).
	3	Check printer DIP switches.
	4	Replace printer interface cable.
	5	Replace logic board. Retain customer's SIMMs.
Known-good LaserWriter does not print	1	Make sure that Chooser and Control Panel settings are correct.
	2	Make sure System is version 7.1.2 (or later).

### Processor Upgrade

The Macintosh Processor Upgrade kit (M3397LL/A) allows 68LC040 computers to switch between back and forth between the PowerPC 601 processor and 68040/68LC040 processors upon restart. The upgrade board includes the PowerPC 601 processor on board and a socket to accept the customer's 68LC040 processor.

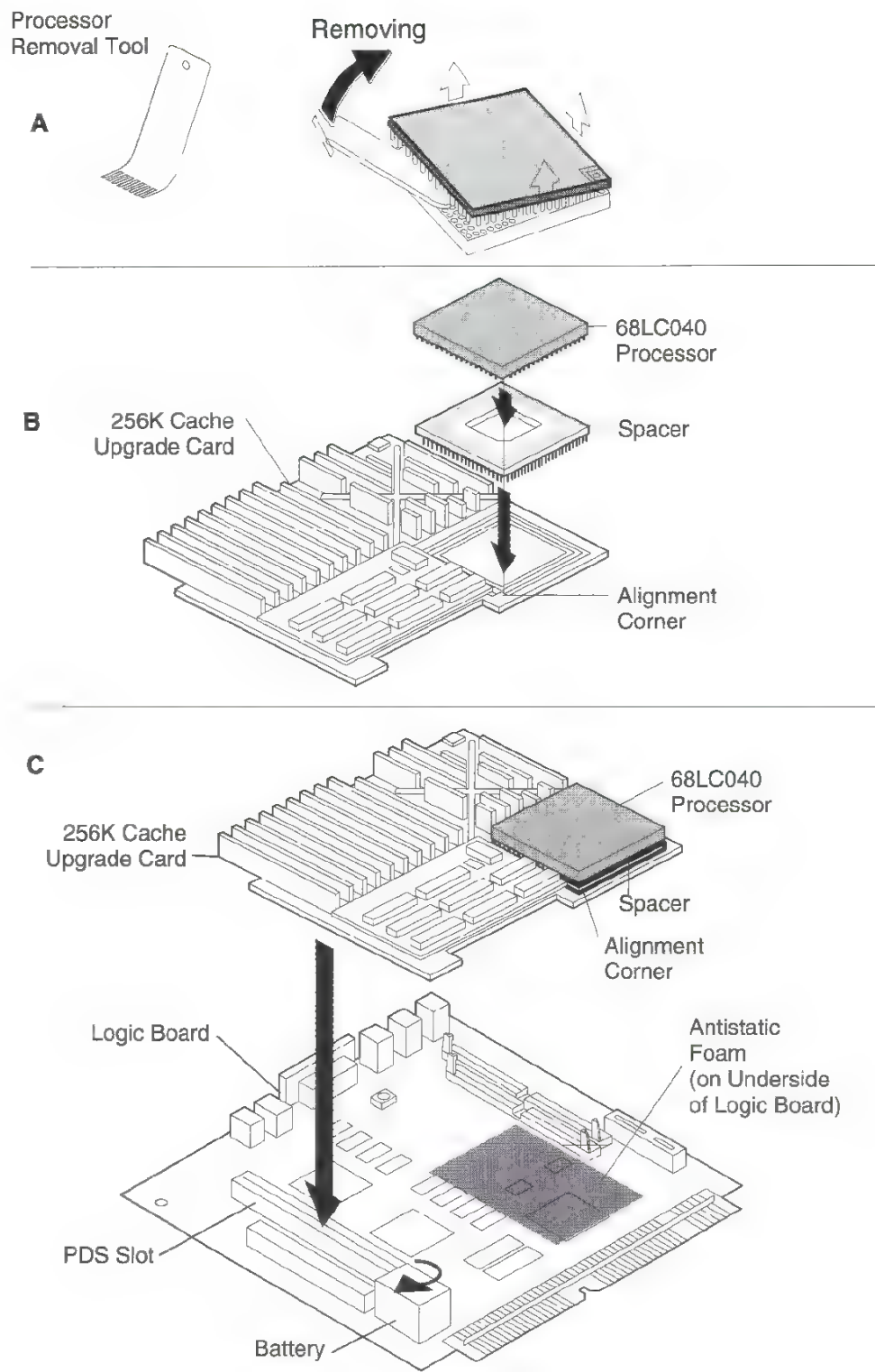
To install the upgrade, you will need a processor removal tool.

1. Remove the 68LC040 processor from the logic board.
2. Position the teeth of the processor removal tool in the groove between the processor and the logic board socket (see Figure 26A).

#### ▲Caution

**Be sure to lift up on the handle of the processor removal tool. Pressing down could damage components on the logic board.**

3. Gently lift up the processor removal tool handle and pry up each side of the processor only slightly to avoid bending the pins from the socket.
4. Remove the processor.
5. Position the alignment corner of the 68LC040 processor over the alignment corner of the spacer. (The alignment corner of the 68LC040 processor is missing one pin. The alignment corner of the spacer is missing a pin hole.) Place the processor on the spacer (see Figure 26B).
6. Place the upgrade board on a firm even surface, and press the processor into the socket until you hear a "snap" (see Figure 26C). Use two thumbs to evenly distribute the pressure as you press the processor into the socket.
7. Place a piece of antistatic foam (see Figure 26C) directly under the processor socket on the bottom side of the logic board.
8. Lift and rotate the battery one quarter turn from its original position on the logic board. (This step makes room for the upgrade board to sit on top of the logic board.)
9. Position the upgrade connector alignment corner over the logic board socket alignment corner.
10. Firmly press the connector pins into the logic board socket (see Figure 26C).



**Figure 26. Processor Upgrade Procedure**



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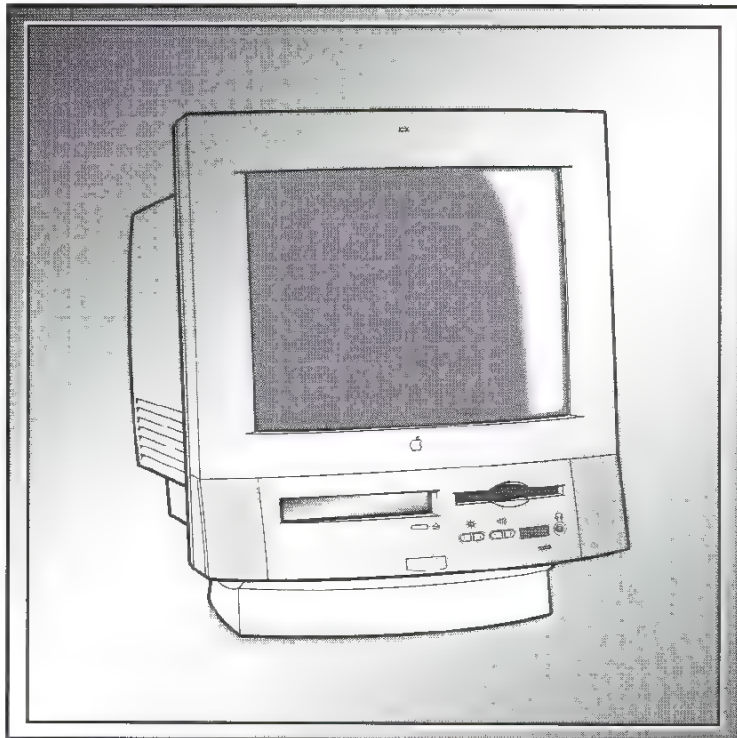
### **Power Macintosh 5300/6300 Logic Board Upgrade**

This following computers can be upgraded to the Power Macintosh 5300/6300 logic board:

- Macintosh 630CD family: LC 630, Quadra 630, Performa 630, Performa 635, Performa 636, Performa 637, and Performa 638.
- Macintosh 5200CD family: Macintosh LC 5200/75, Performa 5200, Performa 5210, Performa 5215, and Performa 5220.
- Macintosh 6200CD series: Performa 6200, Performa 6214, Performa 6216, Performa 6218, Performa 6220, and Performa 6230.

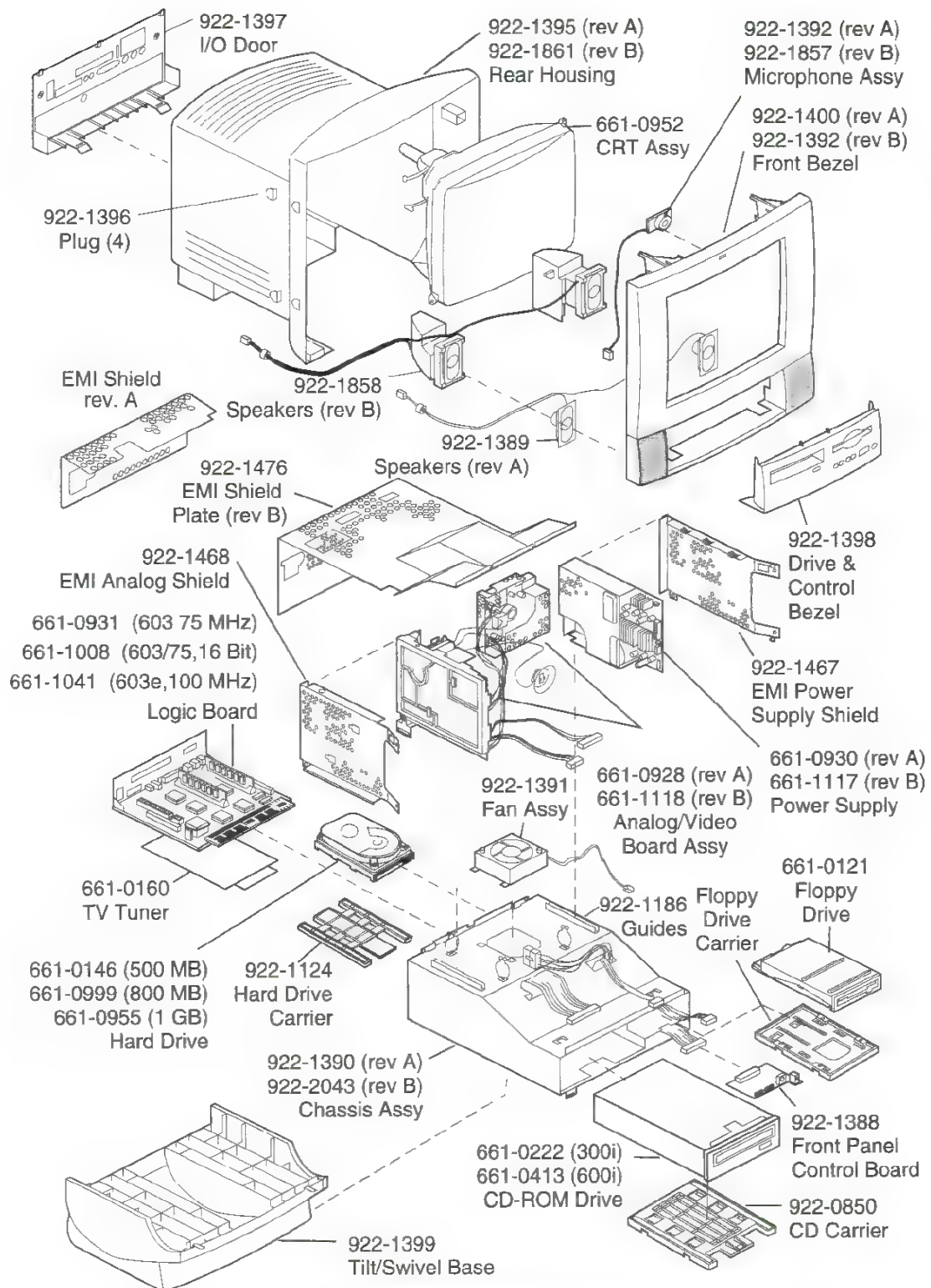
The Power Macintosh 5300/6300 logic board upgrade is a finished goods product (part number M447LL/A).

# Power Macintosh/Performa 5000 Series



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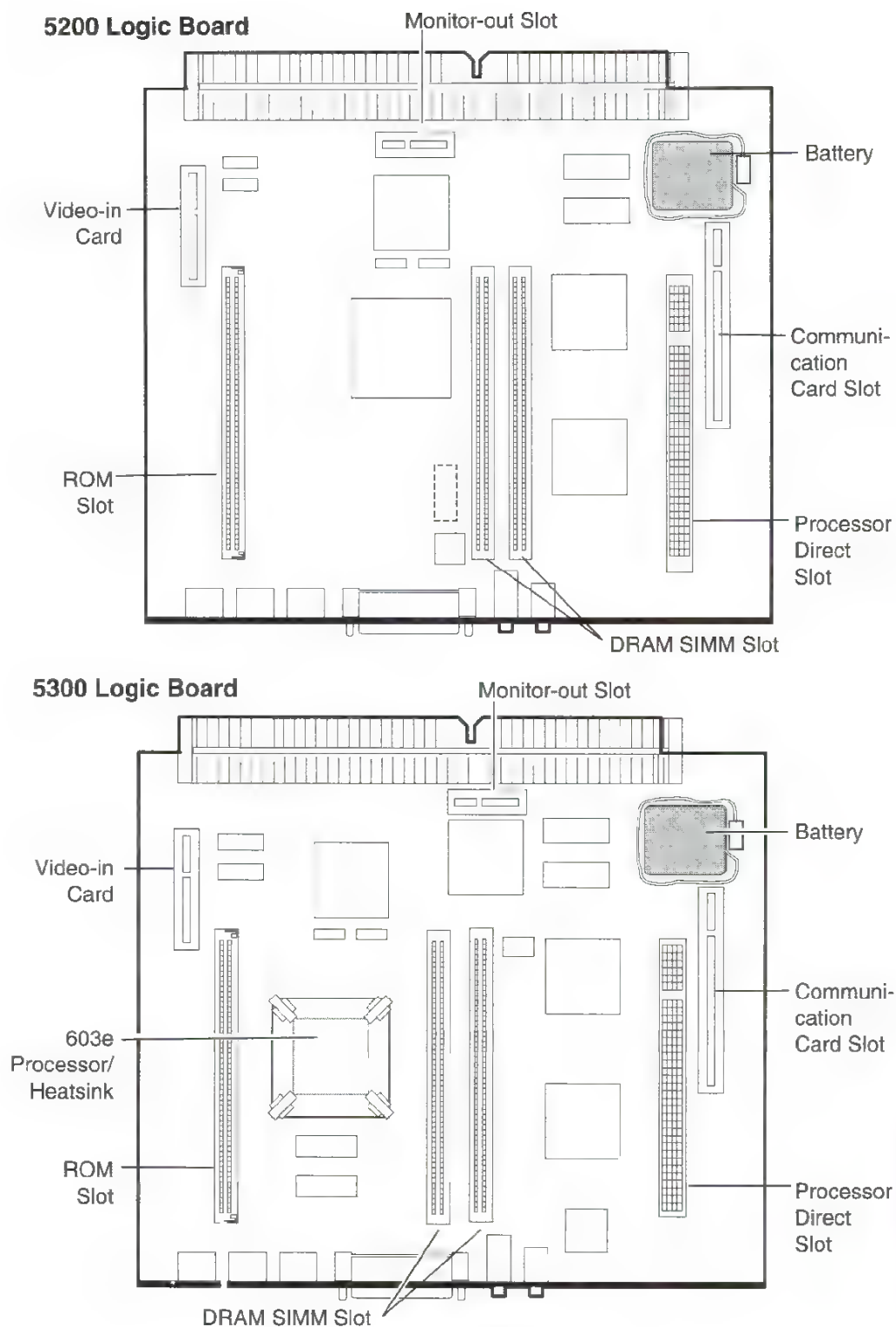
## Exploded View



*This is a generic representation of a product family. Configurations may vary.*

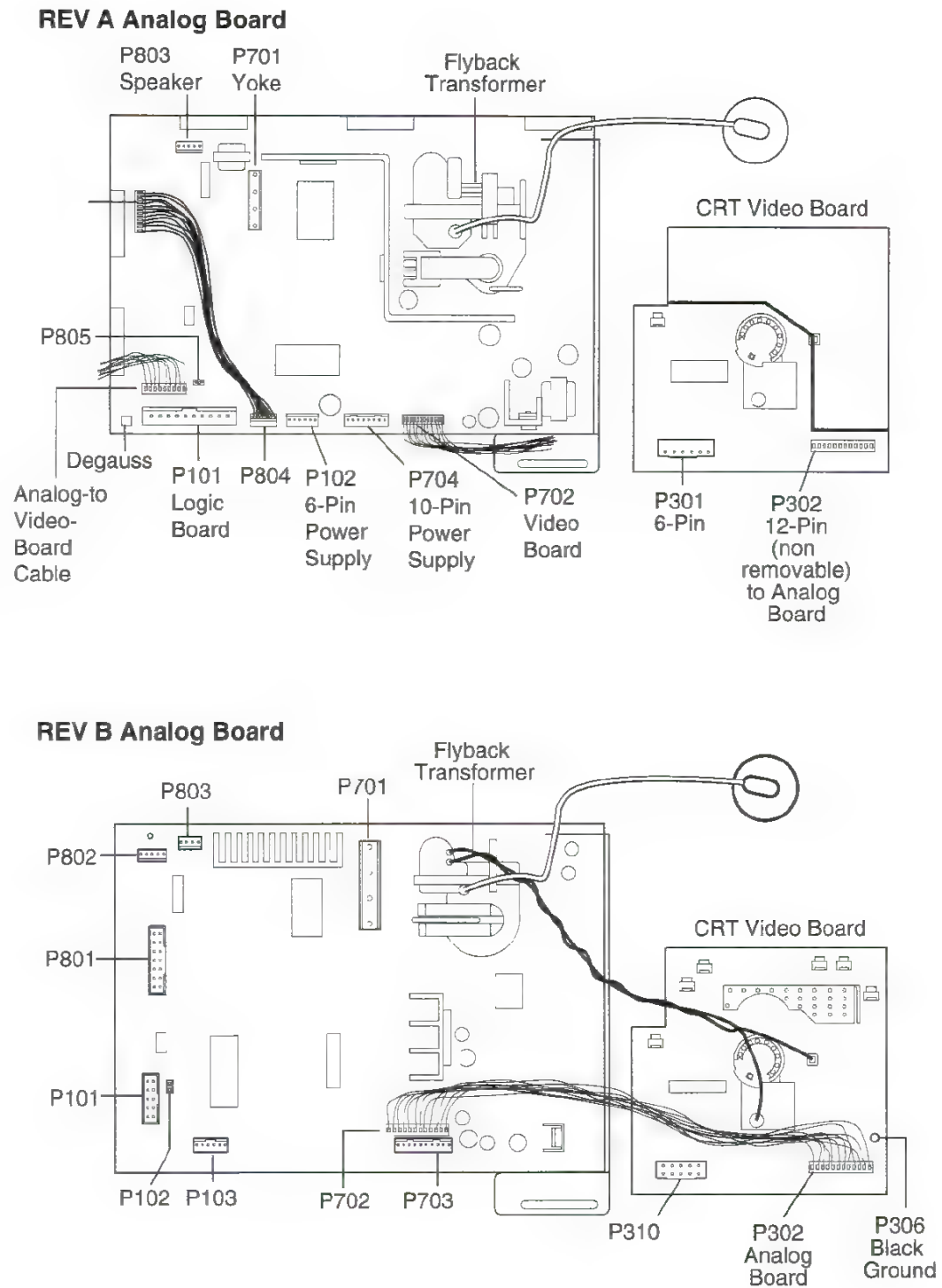
**Figure 27. Power Macintosh/Performa 5000 Exploded View**

## Logic Boards



**Figure 28. Power Macintosh/Performa 5000 Logic Boards**

## Analog Boards

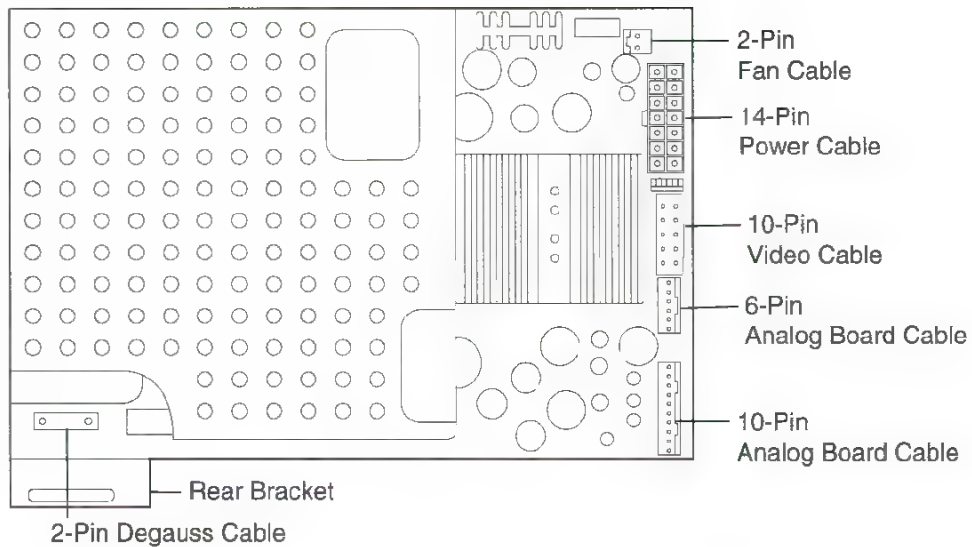


**Figure 29. Power Macintosh/Performa 5000 Analog Boards**

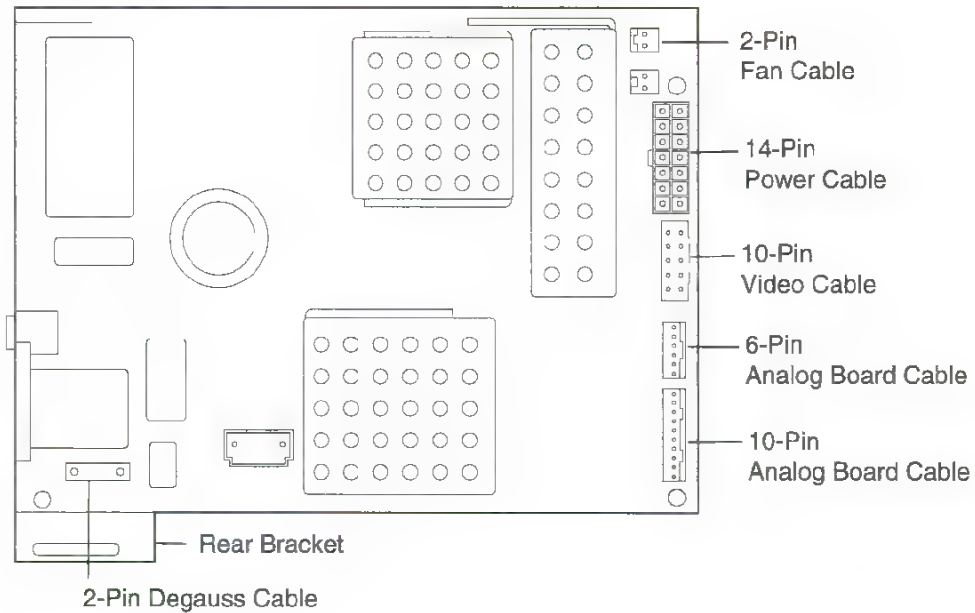


## Power Supplies

### Rev A Power Supply

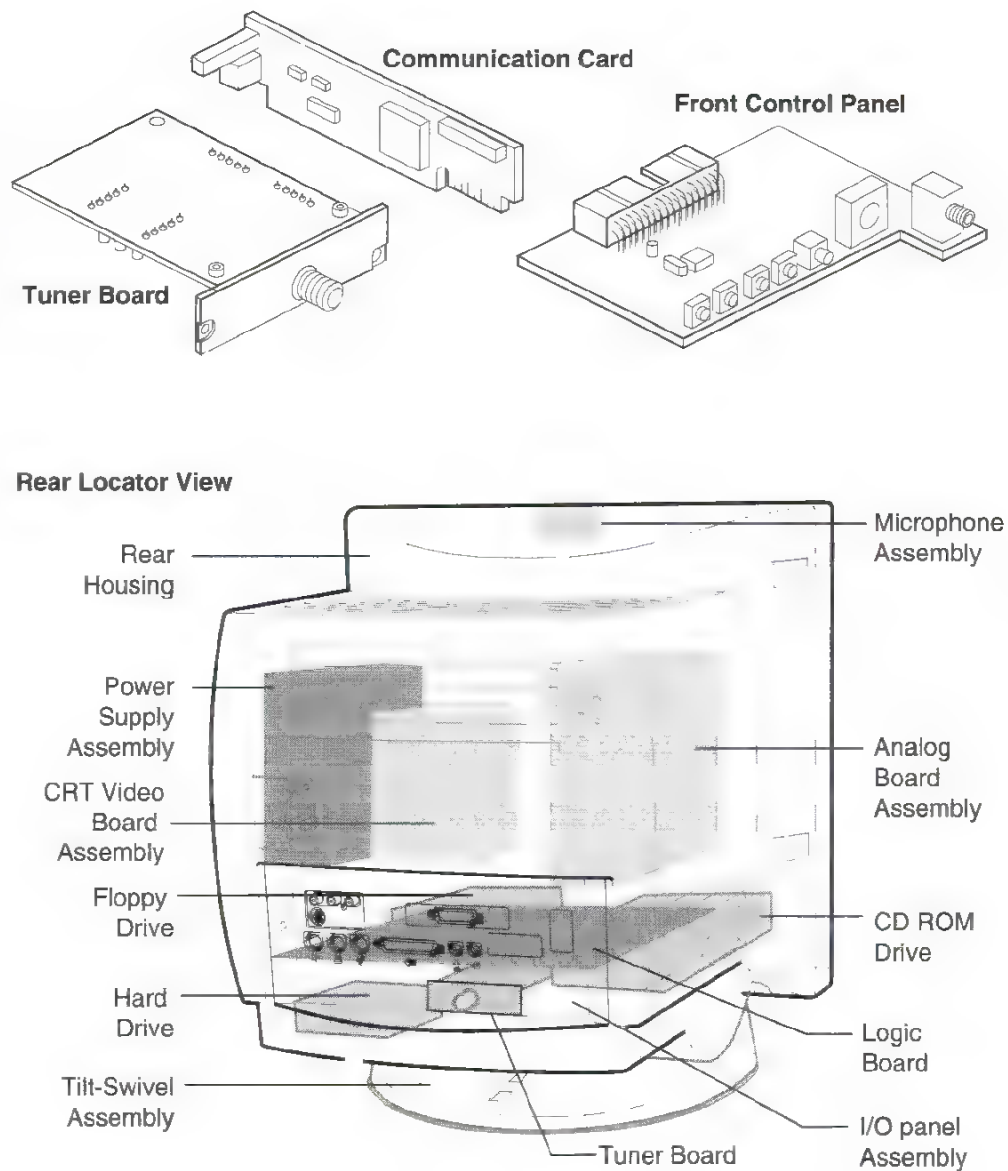


### Rev B Power Supply



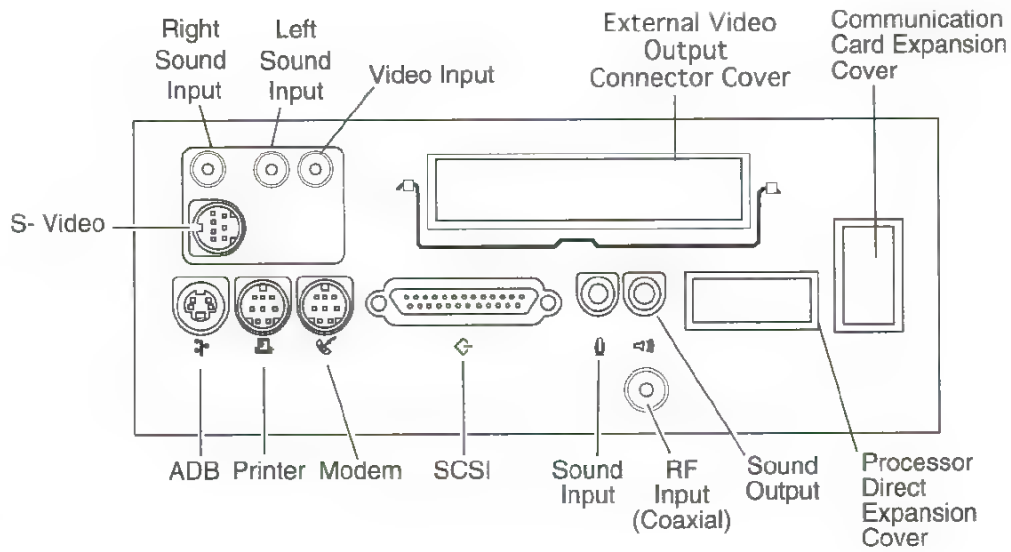
**Figure 30. Power Macintosh/Performa 5000 Power Supplies**

## Other Boards and Locator View



**Figure 31. Power Macintosh/Performa 5000 Other Boards and Locator View**

## Back Panel



**Figure 32. Power Macintosh/Performa 5000 Back Panel**

## Parts List

Adapter, CD Audio, CD 300i+	922-0766
Battery, Alk., 4.5 V, Velcro Mount	922-0750
Bezel, Front (Rev. A)	922-1400
Bezel, Front (Rev. B)	922-1857
Board, Front Panel Display	922-1388
Board, Logic, 100 Mhz, 603e	661-1041
Board, Logic, 603, 75 MHz	661-0931
Board, Logic, 603/75, 16 bit	661-1008
Boards Assembly, Analog and Video (Rev. A)	661-0928
Boards Assembly, Analog and Video (Rev. B) (Use only with 661-1117 and/or 922-2043)	661-1118
Cable, External Video Connector	922-1520
Cable, Ground, Braided, 120 mm (Pkg. of 10)	922-1504
Cable, Ground, Braided, 300 mm (Pkg. of 10)	922-1503
Cable, Monitor Adjustment	922-1513
Cable, MPEG Board (Pkg. of 5)	922-1568
Card, Internal Modem, 14.4 baud	661-1048
Card, MPEG Media System	661-0995
Card, TV Tuner	661-0160
Card, Video-In	661 0159
Carrier, CD-ROM Drive	922-0850
Carrier, Hard Drive	922 1124
CD Audio, Adapter	922-1822
CD-ROM Drive, AppleCD, 300i Plus	661-0222
CD-ROM Drive, AppleCD 600i	661-0913
CD/HD Connector, Adapter	922-1820
Chassis (Rev. A)	922-1390
Chassis (Rev. B)	922-2043
CRT Assembly, Domestic	661-0952
Digital Monitor, Video Add	011-0150
Door, Front	922-1398
Door, I/O	922-1397
Ethernet Card, 10BaseT	661-0888
Ethernet Card, AAUI	661-0889
Fan	922-1391
Feet, Rubber (Pkg. of 20)	922-0040
Fence, Logic Board	922-1567
Floppy Drive, Apple SuperDrive, 1.4 MB, Manual Insert	661-0121
Foot, Platinum (Replaced by 922-0040)	865-0024
Hard Drive, 1.2 GB, 3.5", IDE	661-1106
Hard Drive, 1 GB, 3.5", IDE	661-0955
Hard Drive, 800 MB, 3.5", IDE	661-0999
Hard Drive, 700 MB, 3.5", IDE	661-0069

Hard Drive, 500 MB, 3.5", IDE.....	661-0146
Housing, Rear (Rev. A) .....	922-1395
Housing, Rear (Rev. B) .....	922-1861
Infrared Remote Control.....	922-1184
Keyboard, AppleDesign.....	661-0310
Label, Product ID, Performa 5300CD (Pkg of 25) .....	922-1942
Label, Product ID, Performa 5200 CD (Pkg. of 25) .....	922-1394
Label, Product ID, Performa 5215CD (Pkg. of 25) .....	922-1738
Label, Product ID, Power Macintosh 5300/100 LC .....	922-1899
Label, Product ID, Power Macintosh 5200 LC (Pkg. of 25) .....	922-1470
Microphone (Rev. A) .....	922-1392
Microphone (Rev. B) .....	922-2044
Mouse II, Apple Desktop Bus, Version A.....	661-0763
Mouse II, Apple Desktop Bus, Version B.....	661-0104
Plug, CD Bezel .....	922-0549
Plug, Screw Cover, Rear Housing (Pkg. of 25).....	922-1396
Power Cord, 110 V, Smoke .....	590-0380
Power Supply (Rev. A).....	661-0930
Power Supply (Rev. B) (Use only with 661-1118 and/or 922-2043).....	661-1117
Remote Control .....	922-1201
Screw, CR REC PAN M3x5x6 .....	922-0979
Screw, M 3.5 x 6 x.8 PNCR Rec.....	462-4100
Screw, M3x6, with Two Washers .....	462-3401
Screw, M3x8 mm, Pan Head, Phillips (Pkg. of 10).....	922-0401
Screw, Net, Sems, M3x.5, Pan Head (Pkg. of 25).....	922-0895
Screw, Sems 6-32x.313 PN CRS.....	440-6105
Screw, Sems, 6x32, PN (Pkg. of 25) .....	922-1381
Screw, Sems, M3.5x.6x6 .....	462-4101
Screw, Sems, M3.5x.6x6.0 (Pkg. of 25).....	922-1203
Screw, Torx, K40 1.79x16. TP Flat (Pkg. of 10) .....	922-0392
Screw, Torx .....	922-9392
Shield, EMI, Analog Board .....	922-1468
Shield, Frame, Power Supply .....	922-1467
Shield, Plate, EMI.....	922-1476
SIMM, DRAM, 16 MB, 80 ns, 72 pin.....	661-0087
SIMM, DRAM, 1 MB, 80 ns, 72 pin.....	661-0809
SIMM, DRAM, 4 MB, 80 ns, 72 pin.....	661-0808
Speaker.....	922-1389
Swivel, Tilt .....	922-1399



## Specifications

**Table 5. Power Macintosh/Performa 5000 Series Specifications**

<b>Processor</b>	Performa 5000 Series: Power PC 603 processor, 75 MHz Power Mac 5200 LC: PowerPC 603 processor; 75 MHz Power Mac 5300 Series: PowerPC 603e processor; 100 MHz Addressing: 64-bit PowerPC bus
<b>Memory</b>	DRAM: 8 MB DRAM, minimum, in one SIMM slot, (no soldered RAM on board); Expandable to 64 MB in two SIMM slots (72-pin, 80 ns or faster SIMMs) DRAM Frame Buffer: 1 MB DRAM on board, for video support ROM: 4 MB Cache Memory: 256K level two
<b>Disk Storage</b>	Floppy Drive: 1.4 MB Apple SuperDrive Manual Insert CD-ROM Drive: 5200: Standard Apple 300i Plus CD-ROM drive, 5300/100: Standard AppleCD 600i drive Hard Drive: 5200 Series: 500 MB, 700 MB or 1 GB IDE hard drive, 5300 Series: 1.2 GB hard drive
<b>I/O Interfaces</b>	Serial: Two RS-232/422 serial ports; mini DIN-8 connectors SCSI: One external SCSI port; DB-25 connector Apple Desktop Bus: One Apple Desktop Bus (ADB) port; mini DIN-4 connector Sound Input: Built-in microphone for monaural sound input; Sound-input port for microphone or line input. The port accepts stereophonic input, but sound is combined into monophonic sound for play-through or recording. Sound Output: Two stereophonic sound output ports, level nominally 0.5 volts RMS into 39 ohms, Internal stereo speakers External Video Connector: One DB-15 mirror video out connector using optional video connector kit. This feature provides "mirroring" or display of the system's monitor's screen on a presentation screen. Video-in Slot: One 60-pin video-in slot for optional expansion card providing real-time video display, capture, and overlay TV Tuner: One 10-pin port for TV tuner card Processor-Direct Slot: One 96/114-pin internal expansion slot for LC-compatible processor-direct card Communication Slot: One 112-pin internal expansion slot for modem or Ethernet card Controls: Softpower control from keyboard, Front panel pushbutton control for sound volume, Front panel pushbutton control for display brightness, Infrared remote control option

**Table 5. Power Macintosh/Performa 5000 Series Specifications  
(Continued)**

<b>I/O Devices</b>	<p>Keyboard: Apple Extended Keyboard II (other ADB keyboards supported)</p> <p>Mouse: Apple Desktop Bus Mouse II, Mechanical tracking, optical shaft, or contact encoding</p> <p>Microphone: Integrated microphone for mono sound input</p> <p>Speaker: Integrated stereo speakers capable of delivering 8-bit stereo sound</p>
<b>Sound Generator</b>	<p>Records at 11 kHz or 22 Hz sample rate</p> <p>Plays back at 22 kHz sample rate</p> <p>Two speakers with enhanced stereo sound</p> <p>Allows playback and recording of ordinary audio compact discs</p> <p>16-bit monophonic sound input</p> <p>16-bit stereophonic sound output (16-bit CD stereophonic playback), level nominally 0.5 V RMS into 39 ohms</p> <p>Sound-input port for microphone or line input; accepts stereophonic input, but sound is combined into monophonic sound for play-through or recording</p> <p>Two stereophonic sound output ports, level nominally 0.5 volts RMS into 39 ohms</p> <p>Internal speaker muted when a plug is inserted into an output jack</p>
<b>Built-in Video Display</b>	<p>16" Shadow Mask display (12.8" viewable image)</p> <p>Supports these video modes:</p> <p>640x480 resolution with 16-bit color</p> <p>800x600 resolution with 8-bit color</p> <p>832x624 resolution with 8-bit color (does not support video input)</p> <p>Gun Configuration: Horizontal inline</p> <p>Phosphor (aluminized): P22 derivative</p> <p>Phosphor CIE Coordinates:</p> <p>Red <math>x = 0.625 \pm 0.020</math>, <math>y = 0.340 \pm 0.020</math></p> <p>Green <math>x = 0.280 \pm 0.020</math>, <math>y = 0.595 \pm 0.020</math></p> <p>Blue <math>x = 0.155 \pm 0.015</math>, <math>y = 0.070 \pm 0.015</math></p> <p>Dot Pitch: 0.28 mm</p> <p>Vertical Frequency: 66.7 Hz</p> <p>Active Raster Size (nominal): 9.5 in. by 7.3 in. (240 mm by 185 mm)</p> <p>White Point: 9300° K</p> <p>Shipping Brightness (nominal): 25 foot lamberts</p>

**Table 5. Power Macintosh/Performa 5000 Series Specifications  
(Continued)**

<b>External Video Connector (Optional)</b>	<p>Supports video mirroring on the following external monitors (at product introduction):</p> <ul style="list-style-type: none"> <li>• 640x480 resolution: Macintosh 12" Color Display, Apple Color Plus 14" Display, Apple Performa Plus Display, Apple Multiple Scan 15 Display, Apple Multiple Scan 17 Display, Apple Multiple Scan 20 Display</li> <li>• 800x600 resolution: Apple Multiple Scan 15 Display, Apple Multiple Scan 17 Display, Apple Multiple Scan 20 Display, and SVGA monitors</li> </ul>
<b>Electrical</b>	<p>Line Voltage: 100–240 VAC  Frequency: 47–63 Hz  Power: 125 watts, surge voltage: 300 V RMS for 100 ms, peak inrush current: 40 A pk; current: 2.5 A maximum for all line and load conditions, power: 220 W maximum for all line and load conditions</p>
<b>Physical</b>	<p>Height: 17.5 in. (445 mm)  Width: 16 in. (406 mm)  Depth: 15.1 in. (383 mm)  Weight: Without CD-ROM: 17 lb., With CD-ROM: 19 lb. (21.15 kg), Weight varies with options</p>
<b>Environment</b>	<p>Temperature: Operating: 50° F to 104° F (10° C to 40° C)  Transit (72 hours): -40° F to +149° F (-40° C to +65° C)  Storage (6 months): -40° F to +116° F (-40° C to +47° C)  Humidity: Noncondensing, 20% to 95%  Altitude: 0 to 10,000 ft. (0 to 3,000 m)</p>

## Symptom/Cure Chart

This Symptom/Cure Chart will help you diagnose specific symptoms related to your product. Because the most likely solution is listed first, try the first-listed solution. Verify whether or not the product continues to exhibit the symptom. If the symptom persists, try the next solution. (Note: If you have replaced a module, reinstall the original module before you proceed to the next solution.)

For additional assistance, contact Apple Technical Support.

System	Solutions
System intermittently crashes or hangs	<ol style="list-style-type: none"><li>1 Verify that system software is version 7.5 or later.</li><li>2 Verify that software is known-good.</li><li>3 Verify that software is PowerPC compatible (contact developer).</li><li>4 Clear parameter RAM. Hold down Command-Option-P-R during startup but before "Welcome to Macintosh" appears.</li><li>5 Replace SIMMs.</li><li>6 Replace logic board. Retain customer's SIMMs.</li><li>7 Replace power supply.</li></ol>
System does not power up	<ol style="list-style-type: none"><li>1 Reset logic board.</li><li>2 Replace power supply.</li><li>3 Check power cord connection.</li><li>4 Replace logic board. Retain customer's SIMMs.</li></ol>
System will not power up from keyboard, but will power up from rear power switch	<ol style="list-style-type: none"><li>1 Verify keyboard as known-good.</li><li>2 Replace analog board.</li></ol>
System continually restarts after Shutdown from Special menu	<ol style="list-style-type: none"><li>1 Verify keyboard as known-good.</li><li>2 Replace analog board.</li></ol>
Flashing "?" appears at startup in system with vacant PDS and communication slots	<ol style="list-style-type: none"><li>1 Diagnose hard drive with Disk First Aid included on Power Macintosh CD-ROM.</li><li>2 Perform repairs and then go to step 4.</li><li>3 If repairs are impossible, back up drive, reformat with Drive Setup 1.0.3, and then go to step 4.</li><li>4 Update driver using Drive Setup 1.0.3.</li><li>5 Perform clean install of system software.</li></ol>

---

Flashing “?” appears at start up in system with version B logic board\* and card in PDS or communication slot

- 1 If the ASIC at logic board location U6 does not display a picture in the shape of Texas and there is no rework wire on the underside of the board, replace the logic board.
- 2 If the ASIC at logic board location U6 displays a picture of the state of Texas, perform standard troubleshooting procedures before replacing the logic board.

Menu bar constantly flashes or system constantly beeps

- 1 Verify that front panel control buttons are not jammed.
- 2 Reseat drive bezel and front panel control board.

### Audio

Distorted or garbled sound from both speakers

### Solutions

Replace analog/video board assembly.

Distorted or garbled sound from one speaker

- 1 Replace defective speaker.
- 2 Replace analog/video board assembly.

No sound output from both speakers

- 1 Check sound source.
- 2 Check that speaker cable at connector P803 on analog board is plugged in and is not defective.
- 3 Reseat drive bezel and front panel control board.
- 4 Measure voltage from chassis ground to pin 1 of P102. If you measure 12 volts DC, replace analog board. If you measure close to 0 volts DC, check cable that leads from P102 to power supply.

No sound output from one speaker

- 1 Disconnect speaker cable P803 from analog board. Measure resistance across speaker terminals. If resistance measures an open circuit or a reading much higher than 8 ohms, replace speaker.
- 2 Disconnect speaker cable P803 from analog board. Perform continuity check from speaker terminals to other end of cable. Replace cable if it is open.
- 3 Replace analog/video board assembly.

---

\* Version “B” logic boards display a “B” at the end of the serial number printed on the board near the communications slot port.



Crackling noise is present when you play sounds other than system beeps and you are not in "play through" mode

- 1 If static noise varies when you adjust volume by Sound control panel, use Audio Volume Extension 1.1 or later. Note: Audio Volume Extension is available from standard Apple software update sites.
- 2 Replace logic board.

## Video

Screen is black, too dark, or too bright; audio and drive operate

## Solutions

- 1 Adjust contrast button on front bezel.
- 2 Adjust brightness. Use Screen control panel.
- 3 Check yoke cable connection.
- 4 Perform video adjustments. Refer to the "Video Adjustments" section.
- 5 Replace analog/video board assembly.
- 6 Replace power supply board.
- 7 Replace CRT.

Screen is bright and audio is present, but no video information is visible

- 1 Perform video adjustments. Refer to the "Video Adjustments" section.
- 2 Replace analog/video board assembly.

Video will not play or system hangs when you attempt to run video in units with MPEG card

- 1 If chip at location U12 on MPEG card displays number 341SO205, check all connections.
- 2 If chip at location U12 on MPEG card does not display number 341SO205, replace MPEG card.

Single vertical or horizontal line is displayed

- 1 Replace analog/video board assembly.
- 2 Replace CRT.

Predominant color tint or color cannot be adjusted

- 1 Check cable connection from connector P301 on video board to connector P703 on analog board.
- 2 Perform video adjustments. Refer to the "Video Adjustments" section.
- 3 Replace analog/video board assembly.
- 4 Replace CRT.

Picture breaks into diagonal lines, or picture rolls vertically or horizontally

- 1 Perform geometry adjustments. Refer to "Video Adjustments" section.
- 2 Replace analog/video board assembly.

Out of convergence (color bleeds from text or lines)

- 1 This problem rarely indicates a defective module. Some misconvergence is normal, especially around edges of screen. Contact Apple Technical Support if you're uncertain whether misconvergence is within specification.
- 2 Replace analog/video board assembly.

---

Black screen spots (burnt phosphors)

Replace CRT.

Screen jitters or flashes

- 1 Refer to the first two paragraphs in the "Video Adjustments" section. Move electrical devices (other monitors, scanners, etc.) away from monitor. Temporarily shut off all fluorescent lights in area.
- 2 Move unit to another room or building and check if symptom persists.
- 3 Replace analog/video board assembly.

Out of focus

- 1 Perform focus adjustment. Refer to "Video Adjustments" section.
- 2 Check for proper screen luminance. If luminance is off, perform cutoff and white balance procedures. Refer to the "Video Adjustments" section.
- 3 Replace analog/video board assembly.

Raster size too short/tall or narrow/wide

Install monitor adjustment cable, and set appropriate on-screen video adjustment controls to vertical height of 185 mm (7.3 inches) and to horizontal width of 240 mm (9.5 inches).

Linearity bad (size of text/graphics differs at top, bottom, or sides of screen)

Replace analog/video board assembly.

Raster tilted or shifted

- 1 Refer to the first two paragraphs in the "Video Adjustments" section. Move metal objects away from monitor.
- 2 Perform appropriate geometric adjustments. Refer to "Video Adjustments" section.
- 3 Replace analog/video board assembly.

Raster distorted (barrel-shaped, corners not square, stretched or compressed at top of display, or sides not perpendicular)

- 1 Refer to the first two paragraphs in the "Video Adjustments" section.
- 2 Perform appropriate geometric adjustments. Refer to "Video Adjustments" section.
- 3 Install monitor adjustment cable and use on-screen video adjustment controls to eliminate distortion. Based on video tolerances, some distortion is allowed and setting need not be perfect. Contact Apple Technical Support if you're unsure about tolerance level.
- 4 Replace analog/video board assembly.

Raster not centered

- 1 Adjust horizontal or vertical shift control. Refer to "Video Adjustments" section.
- 2 Install monitor adjustment cable and use on-screen video adjustment controls to center raster. If centering range is insufficient, change the setting of switch SW701 (3-position switch).

Screen has white areas with blotches of color

- 1 Because this purity problem can be caused by magnetic fields, move unit to another location.
- 2 Degauss display with manual degaussing coil. (Degaussing coils can be purchased at most major electronic parts stores.)

### Floppy Drive

Audio and video are present, but internal floppy drive does not operate

### Solutions

- 1 Replace bad disk with known-good disk.
- 2 Replace floppy drive.
- 3 Replace logic board. Retain customer's SIMMs.

Disk ejects; display shows icon with blinking "X"

- 1 Replace bad system disk with known-good system disk.
- 2 Replace floppy drive.
- 3 Replace logic board. Retain customer's SIMMs.

Unable to insert disk all the way

- 1 To eject previously inserted disk, insert opened paper clip into hole beside floppy drive.
- 2 Switch off system and hold mouse button down while switching system on (to complete eject cycle).
- 3 Replace floppy drive.

Disk does not eject

- 1 Insert opened paper clip into hole beside floppy drive.
- 2 Switch off system and hold mouse button down while switching system on (to complete eject cycle).
- 3 Replace floppy drive.

Internal floppy drive runs continuously

- 1 Replace bad disk with known-good disk.
- 2 Replace floppy drive.
- 3 Replace logic board. Retain customer's SIMMs.



---

## Hard Drive

Internal or external hard drive does not operate

## Solutions

- 1 Confirm that all hard drive connections are secure.
- 2 Verify that external drive is properly terminated.
- 3 Reseat logic board.
- 4 Replace internal IDE hard drive.
- 5 Replace chassis/wiring harness.
- 6 Replace logic board. Retain customer's SIMMs.

Internal hard drive runs continuously

- 1 Make sure system software is version 7.5 (or later).
- 2 Replace hard drive cable.
- 3 Replace internal hard drive.
- 4 Replace logic board. Retain customer's SIMMs.

Hard drive not found when booted from CD-ROM drive

Use Drive Setup 1.03.

## CD-ROM Drive

CD-ROM drive does not accept disc

## Solutions

- 1 Exchange disc (if disc is dirty or damaged).
- 2 Replace CD-ROM drive mechanism.
- 3 Replace SCSI data cable.

Volume control does not operate correctly

- 1 Check Sound control panel setting.
- 2 Check front panel controls.
- 3 Reseat the drive and control bezel.
- 4 Make sure that the front panel control board is completely installed.
- 5 Reseat CD adapter connector.
- 6 Replace CD adapter connector.
- 7 Replace CD-ROM drive.
- 8 Replace chassis/wiring harness.

Computer cannot mount known-good CD-ROM drive

- 1 Reseat CD-ROM drive adapters.
- 2 Check SCSI ID setting. (Internal CD-ROM drive was originally set to 3 at factory.)
- 3 Replace CD-ROM drive.
- 4 Replace chassis/wiring harness.

When an internal and external SCSI device are present, only one powers up

- 1 Verify that ID switch setting on external SCSI device is higher than 0. Verify that ID switch setting on external SCSI device does not duplicate ID switch settings on other external SCSI devices.
- 2 Replace terminator on external SCSI device.
- 3 Replace SCSI select cable

## Peripheral

Cursor does not move

- 1 Reboot system.
- 2 Check mouse connection.
- 3 If mouse was connected to keyboard, connect mouse to rear ADB port and disconnect keyboard. If mouse works, replace keyboard. If mouse does not work in ADB port, replace mouse.
- 4 Reseat logic board.
- 5 Replace logic board. Retain customer's SIMMs.

Cursor moves, but clicking mouse button has no effect

- 1 Replace mouse.
- 2 Reseat logic board.
- 3 Replace logic board. Retain customer's SIMMs.

Cannot double-click to open application, disk, or server

- 1 Remove extra system files on hard drive.
- 2 Check mouse speed on Control Panel.
- 3 Unplug 5.4 battery, wait 20 seconds, plug in battery, and restart computer.
- 4 If mouse was connected to keyboard, connect mouse to rear ADB port and disconnect keyboard. If mouse works, replace keyboard. If mouse does not work in ADB port, replace mouse.
- 5 Replace logic board. Retain customer's SIMMs.

No response to any key on keyboard

- 1 Make sure System software is version 7.5 (or later).
- 2 Check keyboard connection to ADB port.
- 3 Replace keyboard.
- 4 Reseat logic board.
- 5 Replace logic board. Retain customer's SIMMs.



Known-good ImageWriter or ImageWriter II does not print

- 1 Make sure that Chooser and Control Panel are set correctly.
- 2 Verify that printer driver and system software are not corrupt.
- 3 Make sure system software is version 7.5 (or later).
- 4 Check printer DIP switches.
- 5 Replace printer interface cable.
- 6 Replace logic board. Retain customer's SIMMs.

Known-good LaserWriter does not print

- 1 Make sure that Chooser and Control Panel are set correctly.
- 2 Verify that printer driver and system software are not corrupt.
- 3 Replace printer interface cable(s).

Clicking, chirping, or thumping sound

- 1 Replace analog board.
- 2 Replace logic board. Retain customer's SIMMs.

#### **Miscellaneous**

Clicking, chirping, or thumping sound

#### **Solutions**

- 1 Replace analog board.
- 2 Replace logic board. Retain customer's SIMMs.

Smoke/odor

Replace analog board.

No video, no audio, and no drive operation

- 1 Connect power cord.
- 2 Switch power on.
- 3 Replace power cord.
- 4 Replace analog board.
- 5 Replace logic board. Retain customer's SIMMs.

"Sad Macintosh" icon

- 1 Verify no disc in CD-ROM drive.
- 2 Disconnect all external SCSI devices and attempt to restart computer.
- 3 Disconnect internal SCSI device and attempt to start computer with known-good floppy disk.
- 4 Replace bad SCSI drive with known-good SCSI drive.
- 5 Replace RAM SIMMs on logic board.
- 6 Replace logic board. Retain customer's SIMMs.

Screen shows "Sad Macintosh" icon and black vertical lines; screeching sound

- 1 Replace RAM SIMMs on logic board.
- 2 Replace logic board. Retain customer's SIMMs.

Rattling sound at startup in system with Apple External Video Connector

Press or fold Apple External Video cable to prevent it from contacting fan blades.

Headphone jack does not operate correctly

- 1 Verify that headphone jack is seated properly.
- 2 Replace front panel control board.
- 3 Replace chassis/wiring harness.

No sound from known-good external speakers

- 1 Check that volume is turned on (manually or through Control Panel).
- 2 Verify that headphones are unplugged.
- 3 Verify that speaker connectors are properly connected.
- 4 Replace logic board. Retain customer's SIMMs.

Menu bar flashes continually or system sounds continually

- 1 Verify that front panel control buttons are not jammed.
- 2 Verify "mute" is not selected in the sound Control Panel.
- 3 Reseat drive bezel and front panel control board.

System with internal modem is unable to recognize graphics or Ethernet card in communications slot

- 1 Replace internal modem.
- 2 Replace graphics or Ethernet card.

---

## Video Adjustments

Jitter, faint lines, or screen movement can be caused by external interference such as electronic devices and fluorescent lights. Move the unit to another room or building to help determine if external interference is the source of the problem.

A misadjusted screen can mimic the same symptoms as analog board or CRT failures. By performing the adjustment procedures, you might determine if one or more of the adjustments is the cause of the problem.

### ▲Warning

**This product contains high voltage and a high-vacuum picture tube. To prevent serious injury, review CRT safety in Chapter 1, Safety.**

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## Geometry Adjustments

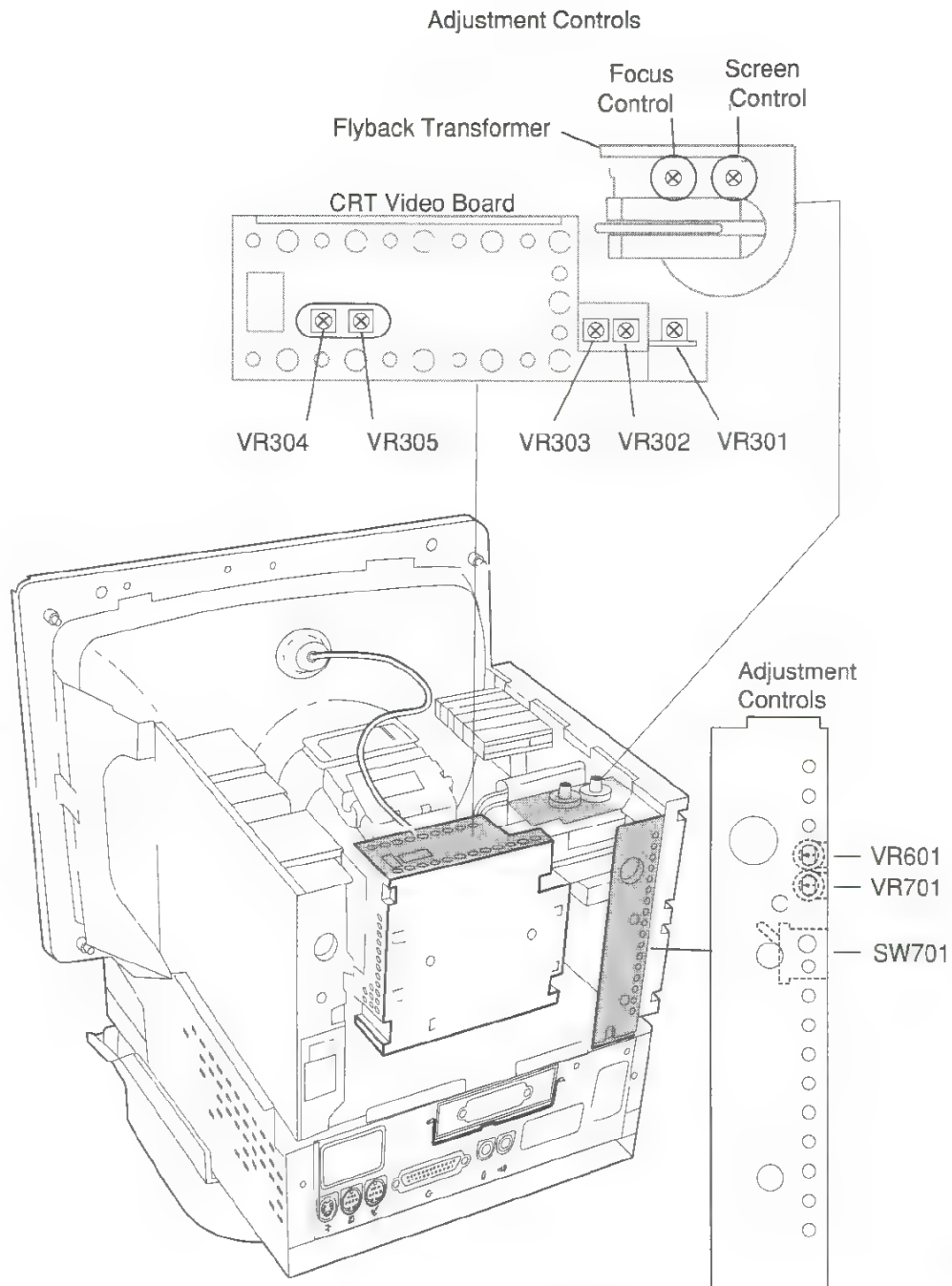
The controls on this monitor require a small plastic Phillips-head tool or a small plastic flat-head tool to make adjustments. Do not use metal alignment tools—they are a shock hazard.

## Centering Adjustments

1. Run the Display Service Utility to display the All-White Screen test pattern.
2. Using a flat-head plastic adjustment tool, adjust the horizontal (VR701) and vertical (VR601) shift controls until the raster is centered on the screen (see Figure 33).
3. If necessary, use a plastic tool to reposition the arm of the horizontal centering switch, SW701, (see Figure 33). Switch SW701 has three positions. You can control the horizontal centering of the display either by using SW701 together with the horizontal shift control (VR701) or by using VR701 alone.

## Focus

1. Run the Display Service Utility to display the Focus test pattern.
2. Using a flat-head plastic adjustment tool, adjust the focus control (see Figure 33) on the flyback transformer until the Focus test pattern reaches the best center-of screen performance.

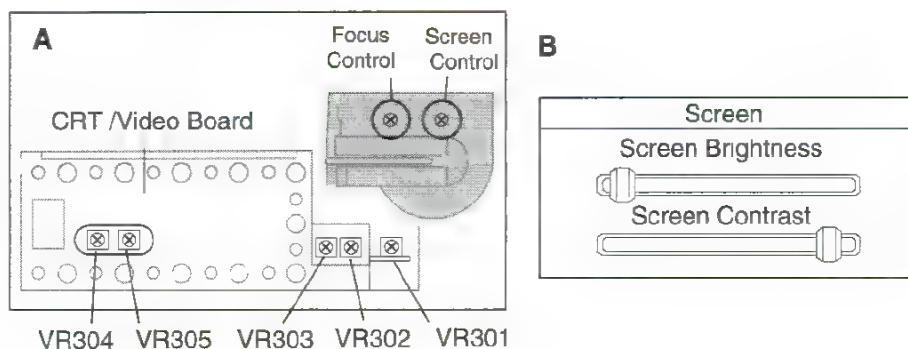


**Figure 33. Geometry Adjustments**

## Cutoff

Perform the cutoff adjustment whenever you replace the CRT or the deflection board or whenever the screen control has been inadvertently changed. Also, perform the cutoff and white balance adjustments after the monitor has been on for at least 10 minutes.

1. Using a fine-tip plastic adjustment tool, set the sub-contrast control (VR301) on the CRT/video board to its maximum (fully clockwise) position (see Figure 34A). The screen becomes brighter.
2. From the desktop, select and open the Screen icon to open the on-screen control panel.
3. Set the Screen Brightness slider control to its minimum (far left end) position (see Figure 34B).
4. Set the Screen Contrast slider control to its maximum (far right end) position (see Figure 34B).
5. Set the green gain (VR303) and red gain (VR302) controls to their middle positions (see Figure 34A).
6. Run Display Service Utility to display the Gray Bars test pattern.
7. Using a fine-tip plastic adjustment tool, set the red bias (VR304) and the green bias (VR305) controls to their minimum (counterclockwise) positions (see Figure 34A).
8. Adjust the screen control on the flyback transformer very slowly until the third darkest bar from the left is just faintly visible. The screen control is now set correctly and shouldn't have to be readjusted unless inadvertently altered.



**Figure 34. Cutoff Adjustment**



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## White Balance

Perform the white balance adjustments after the monitor has been on for at least 10 minutes and the cutoff procedure has just been completed.

1. Run the Display Service Utility to display the Gray Bars test pattern.
2. Adjust the red bias (VR304) and green bias (VR305) controls (refer to Figure 34A) to neutralize the eight darkest bars.
3. If the screen shows a predominant blue color, adjust the green bias control (VR305) until it's difficult to tell whether the eight darkest bars are blue or green.
4. Adjust the red bias control (VR304) until the bars appear to be shades of gray.

### Note

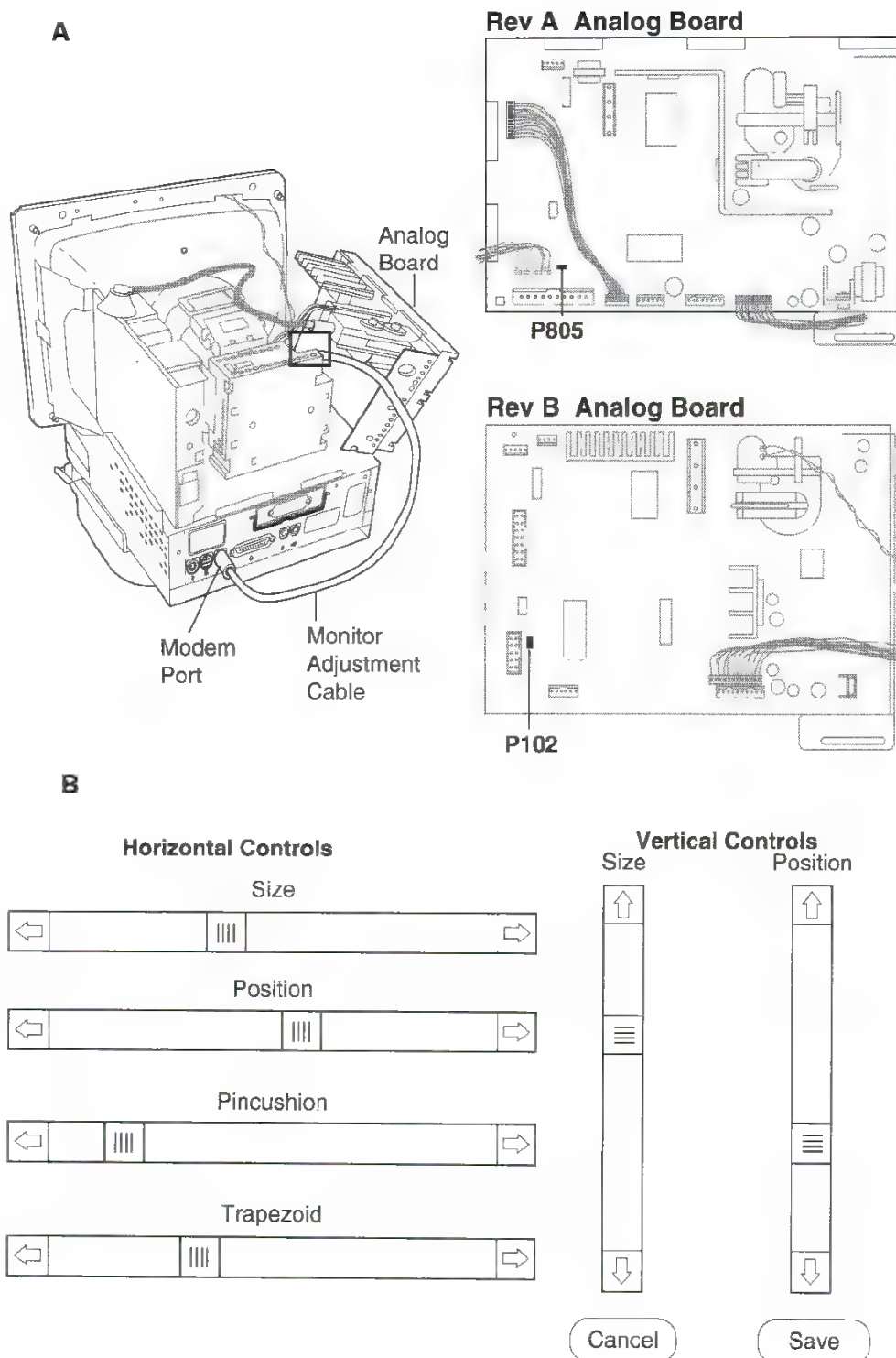
If the predominant color is too red or too green, reduce the levels of both the green and red bias controls to neutralize the predominant color. The darkest bar must remain completely black, and the second darkest bar should be just barely visible.

5. From the desktop, open the Screen icon to open the on-screen control panel.
6. Set the Screen Brightness slider control to its center position. The screen might appear too bright and out of focus.
7. Run the Display Service Utility to display the All-White Screen test pattern.
8. Hold a light meter or photometer against the center of the screen.
9. Adjust the sub-contrast control (VR301) to decrease the screen brightness until the screen luminance measures:
  - Upper end of 10 on the 10 through 18 scale of light meter Model L-248
  - 21 foot candles on the red scale of light meter Model L-246
  - 25 fL (foot lamberts) on a photometer
10. Run the Display Service Utility to display the Gray Bars test pattern.
11. In most cases the eight brightest bars will appear to be shades of gray, and the leftmost bar will be solid black. If not, adjust the red (VR302) and green (VR304) gain controls until the color of the eight brightest bars is neutralized.
12. Check the screen luminance again and reset it to the proper reading by repeating step 9.

---

## On-Screen Video Adjustments

1. Remove the three Phillips screws that secure the analog board to the chassis.
2. Tilt the analog board back, being careful not to put stress on the cables (see Figure 35A).
3. Identify what type of analog board you have before proceeding (see Figure 35A).
  - Rev A analog boards—Locate jumper P805 near the logic board connector on the lower-left corner of the analog board. The square silkscreened marking at P805 indicates pin 1 on the analog board.
  - Rev B analog boards—Locate jumper P102 near connector P102 on the lower-left corner of the analog board. (Rev B boards are used only in the Power Macintosh 5200/75 LC and Power Macintosh 5300/100 LC).
4. Remove the shunt that covers the pins of jumper P805 (Rev A) or P102 (Rev B).
5. Connect one end of the monitor adjustment cable to P805 (Rev A) or P102 (Rev B). Be sure to position the connector so the pin 1 opening is aligned over pin 1 (square marking) on the analog board.
6. Connect the other end of the monitor adjustment cable to the modem port (see Figure 35A). You must use the modem port. Remove the internal modem and plastic modem port cover, if present.
7. Route the monitor adjustment cable so it stays clear of sharp edges and remains slack.
8. Reinstall the analog board. Be sure to reconnect the grounding screw to the EMI shield.
9. Replace the anode cap. Position the monitor so you can see the screen. Turn on the power.
10. Run the Display Service Utility to display the on-screen video adjustment controls. These controls appear after the last test pattern.
11. Use the scroll bars (see Figure 35B) to adjust the horizontal and vertical controls.
12. Save the last screen resolution, and exit the Display Service Utility.



**Figure 35. On-Screen Adjustments**

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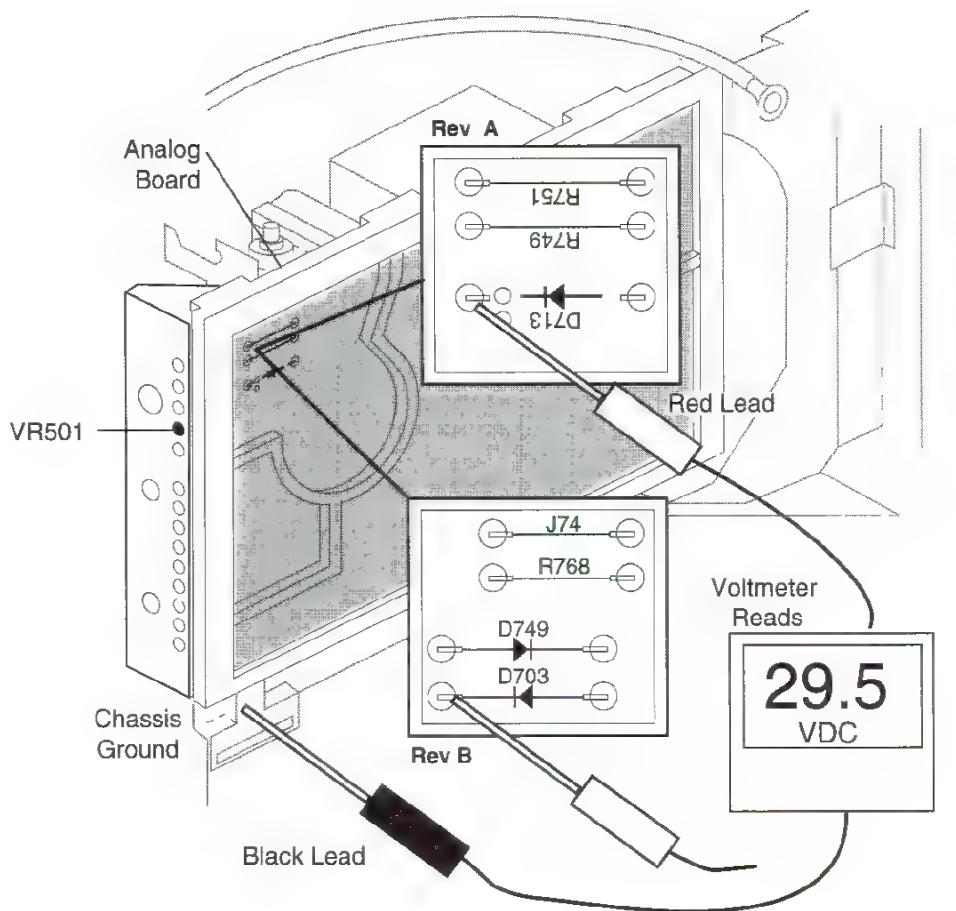
## High Voltage Adjustment

Perform the high voltage adjustment whenever you replace the CRT or the deflection board. Also, perform the high voltage adjustment after the monitor has been on for at least 10 minutes.

### ▲Warning

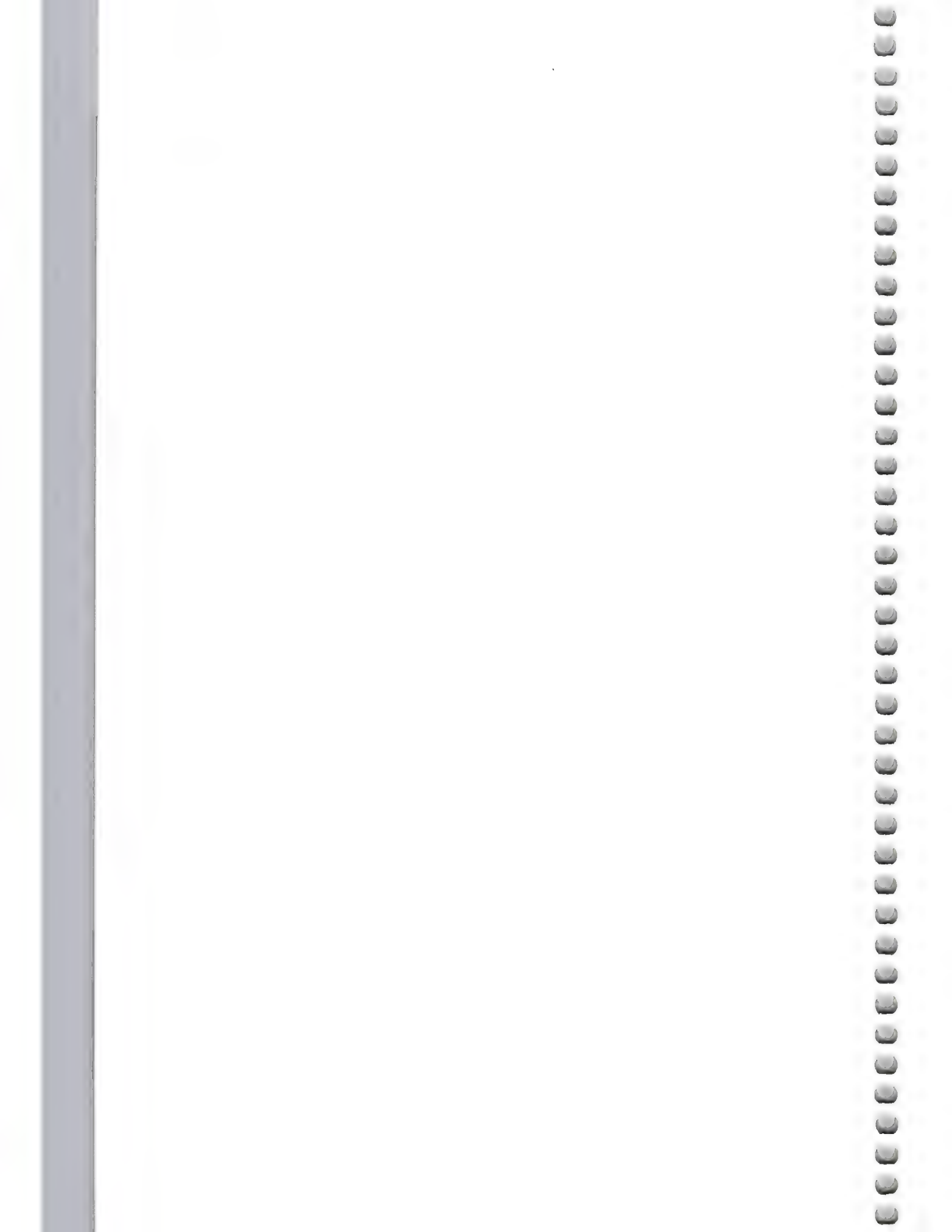
**This product contains high voltage and a high-vacuum picture tube. To prevent serious personal injury or equipment damage, review the CRT safety instructions in Chapter 1, Safety.**

1. Run the Service Display Utility to display the Crosshatch test pattern.
2. Locate diode D713 (Rev A board) or diode D703 (Rev B board) on the analog board (see Figure 36).
3. Connect a digital voltmeter as follows:
  - Attach the red (positive) lead of the voltmeter to the cathode side of diode D713 (Rev A board) or D703 (Rev B board).
  - Attach the black (negative) lead of the voltmeter to the metal chassis ground.
4. Using a fine-tip plastic adjustment tool, set VR501, the high-voltage adjustment control (see Figure 36), so the voltmeter reads 29.5 volts DC ( $\pm 0.1$  volt).

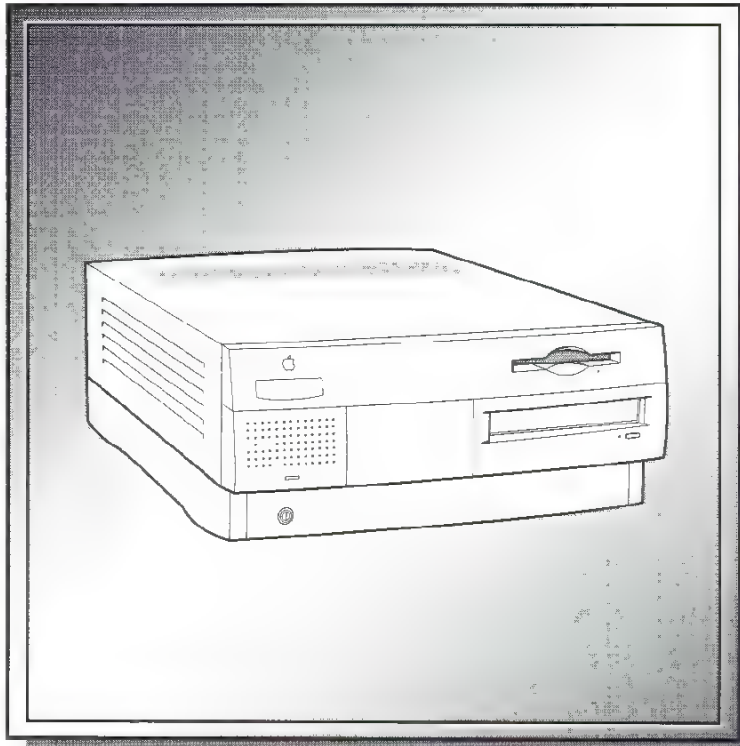


**Figure 36. High Voltage Adjustment**



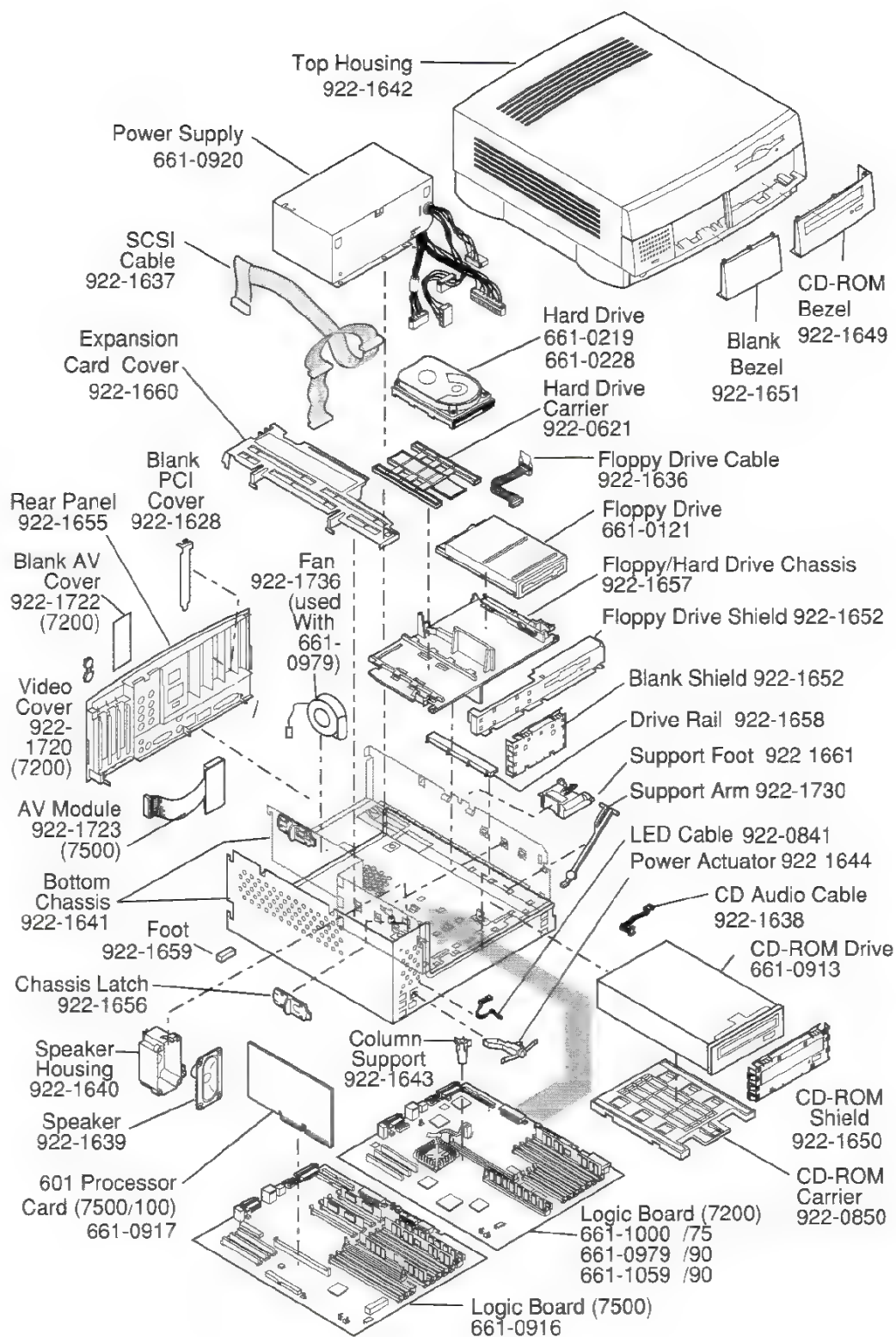


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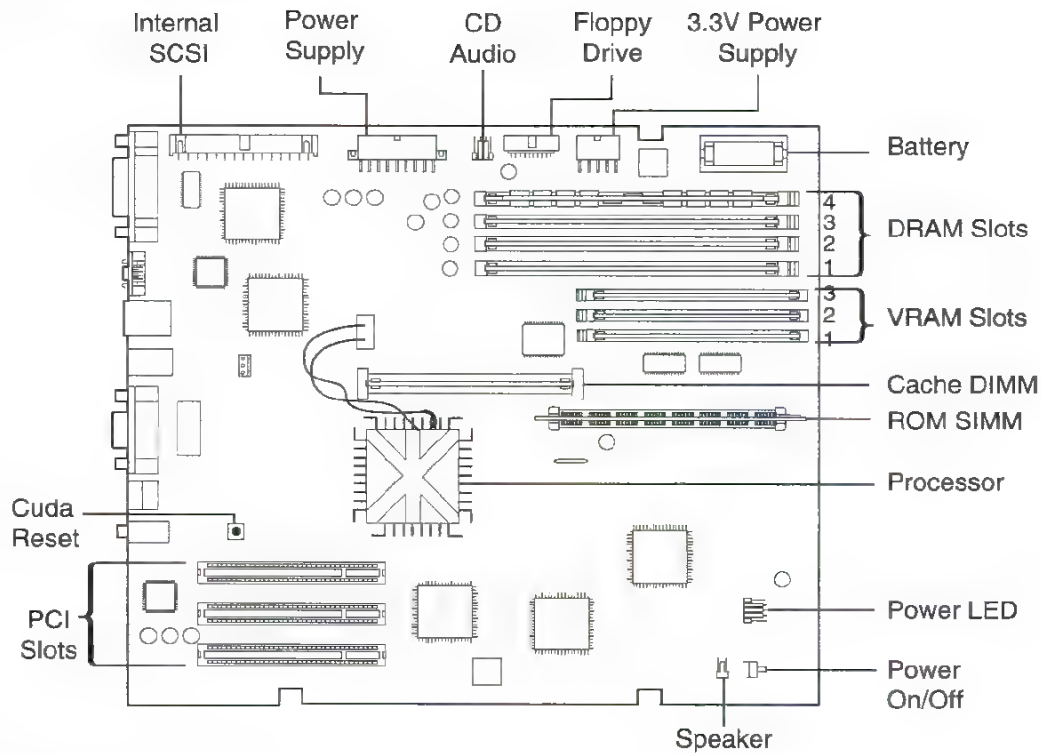
## Exploded View



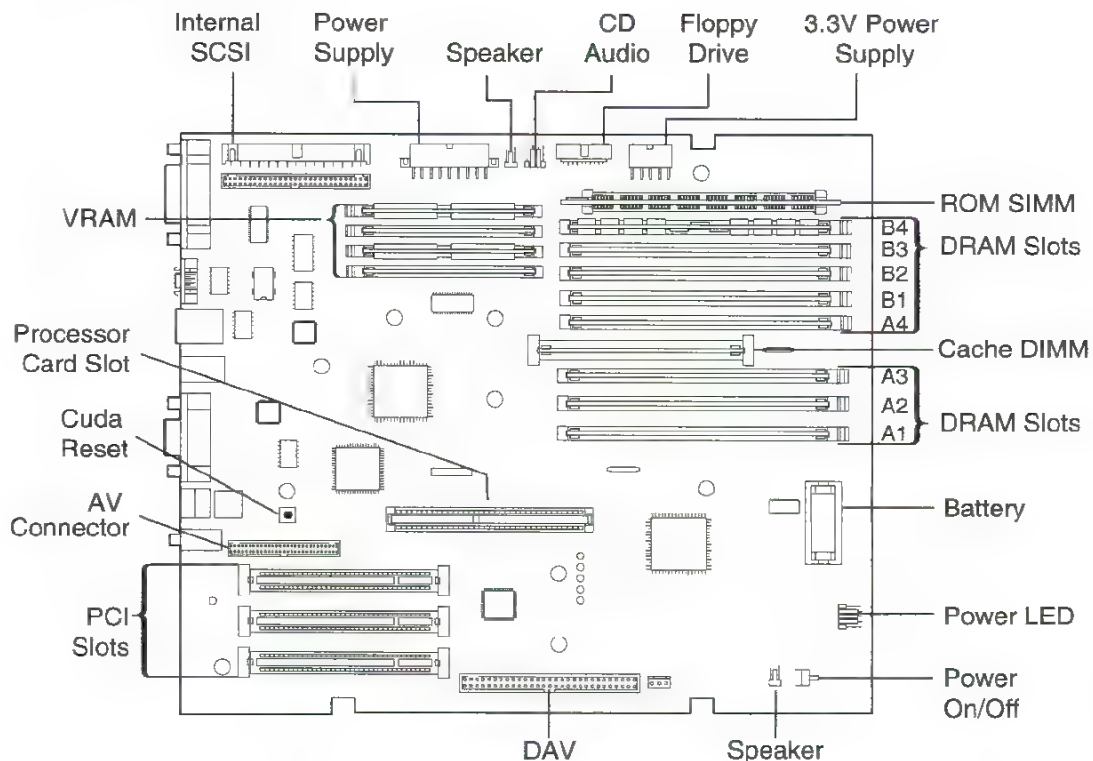
**Figure 37. Power Macintosh 7200/7500 Exploded View**

## Logic Boards

### Power Macintosh 7200



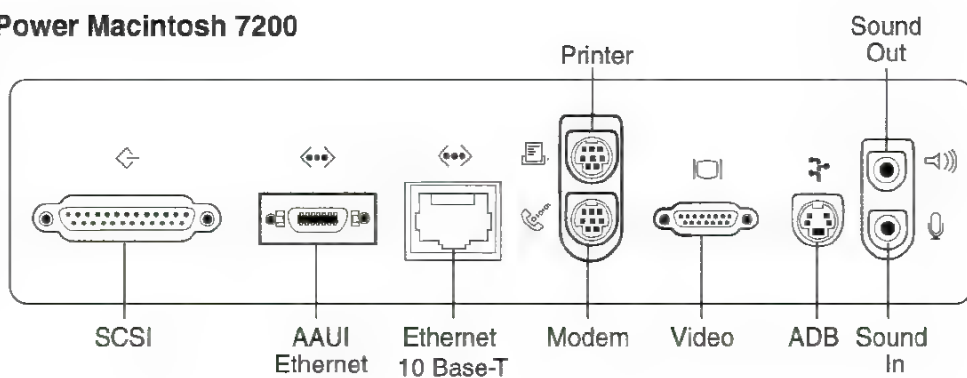
### Power Macintosh 7500



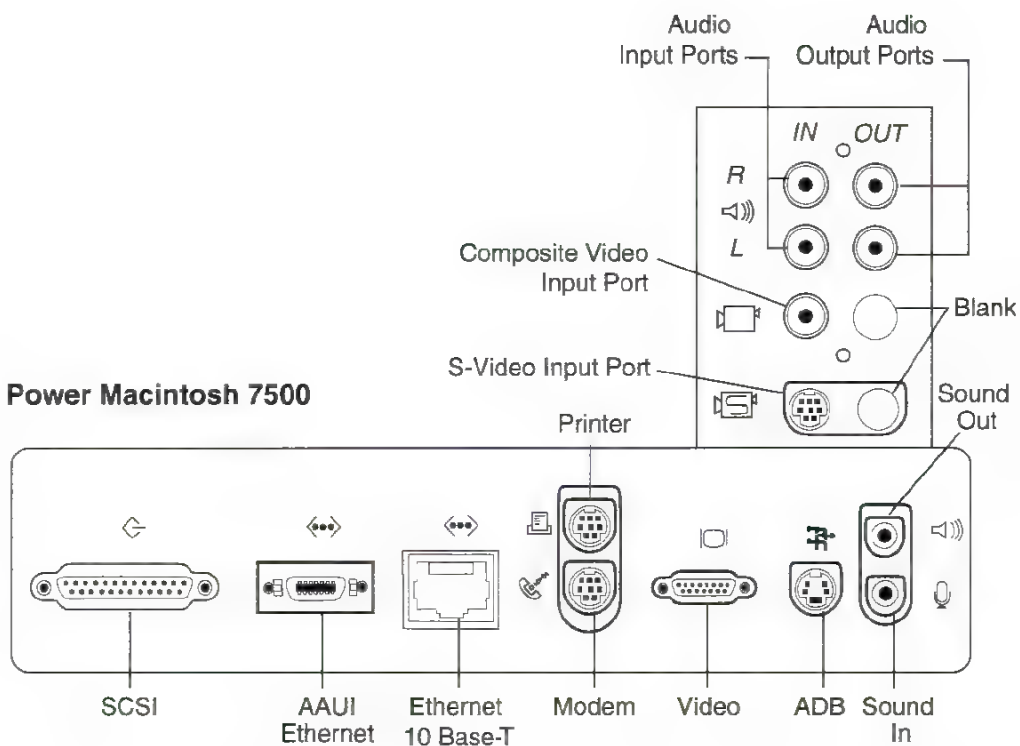
**Figure 38. Power Macintosh 7200/7500 Logic Boards**

## Back Panels

### Power Macintosh 7200



### Power Macintosh 7500



**Figure 39. Power Macintosh 7200/7500 Back Panels**



---

## Parts List

Actuator, Power (Pkg. of 10) .....	922-1644
Battery, Lithium, 3.6 V, without leads .....	922-1262
Bezel, Blank, 3.5" Drive Bay (Pkg. of 5) .....	922-1651
Bezel, Blank, 5.25" Drive Bay (Pkg. of 5) .....	922-1653
Bezel, CD-ROM Drive (Pkg. of 5) .....	922-1649
Board, Logic, Power Macintosh 7500 .....	661-0916
Board, Logic, Power Macintosh 7200/90, Requires Fan.....	661-0979
Board, Logic, Power Macintosh 7200/75 .....	661-1000
Board, Logic, Power Macintosh 7200/90 .....	661-1059
Board, Logic, Power Macintosh WS 7250/120 .....	661-1080
Cable, CD-ROM Audio (Pkg. of 5) .....	922-1638
Cable, Floppy Drive (Pkg. of 5) .....	922-1636
Cable, Hard Drive/CD-ROM Drive, SCSI.....	922-1637
Cable, LED .....	922-0841
Card, 601 Processor, 100 MHz, Power Macintosh 7500 .....	661-0917
Carrier, CD-ROM Drive .....	922-0850
Carrier, FDHD, 3.5" .....	922-1124
Carrier, Hard Drive/Tape Drive, 3.5" .....	922-0621
CD-ROM Drive, AppleCD 600i .....	661-0913
Chassis, Bottom .....	922-1641
Chassis, Drive.....	922-1657
Column, Top Cover Support .....	922-1643
Connector Assembly, AV Module .....	922-1723
Cover, Battery Holder .....	520-0344
Cover, Blank, PCI Card (Pkg. of 10) .....	922-1628
Cover, Expansion Card.....	922-1660
Cover, Video Out (Pkg. of 5) .....	922-1720
DIMM, Cache, 256K, 11 ns, 160 pin.....	661-1035
DIMM, DRAM, 8 MB, 70 ns, 168 pin .....	661-0918
DIMM, DRAM, 16 MB, 70 ns, 168 pin .....	661-0919
DIMM, VRAM, 1 MB, 70 ns, 112 pin.....	661-1036
EMI Clip (Pkg. of 5) .....	922-1721
Fan, Auxiliary, For Use With 661-0979 Only.....	922-1736
Floppy Drive, Apple SuperDrive, 1.4 MB, Manual Insert.....	661-0121
Foot (Pkg. of 10).....	922-1659
Gasket, EMI Shield, Leaf Seal (Pkg. of 10) .....	922-1895
Hard Drive, 1 GB, 3.5", SCSI.....	661-0228
Hard Drive, 1.2 GB, 3.5", SCSI.....	661-1142
Hard Drive, 800 MB, 3.5", SCSI.....	661-1102
Hard Drive, 500 MB, 3.5", SCSI.....	661-0219
Housing, Speaker .....	922-1640
Housing, Top .....	922-1642
Keyboard, AppleDesign.....	661-0310

Label, FCC, Power Macintosh 7200 (Pkg. of 10).....	922-1629
Label, FCC, Power Macintosh 7500 (Pkg. of 10).....	922-1646
Label, Product ID, Power Macintosh 7200/90 (Pkg. of 10).....	922-1630
Label, Product ID, Power Macintosh 7500/100 (Pkg. of 10).....	922-1647
Label, Product ID, Power Macintosh 7200/75.....	922-1849
Label, Product ID, WS 7250/120 (Pkg. of 10).....	922-2214
Latch, Internal Chassis (Pkg. of 10).....	922-1656
Microphone, Apple PlainTalk .....	922-0867
Mouse II, Apple Desktop Bus, Version B.....	661-0104
Panel, Rear.....	922-1655
Panel, Blank, AV Module (Pkg. of 5), Power Macintosh 7200.....	922-1722
Power Cord, Smoke, Power Macintosh 7200.....	590-0380
Power Cord, Smoke, Power Macintosh 7500.....	590-0760
Power Supply, 150 W.....	661-0920
Rail, Drive (Pkg. of 10) .....	922-1658
Screw, M2.5x8mm Power Macintosh 7500 (Pkg. of 10).....	922-0077
Screw, M3.1X10, TORX-T10 (Pkg. of 10) .....	922-1672
Screw, M3.5x0.6x10mm (Pkg. of 10) .....	922-0119
Screw, M3.5X5mm (Pkg. of 10) .....	922-1671
Screw, M3x8mm, Pan Head, Philips (Pkg. of 10).....	922-0401
Screw, Sems 6-32x.313 PN CRS.....	440-6105
Shield, Blank Bezel, 5.25" Drive Bay (Pkg. of 5).....	922-1654
Shield, Blank, 3.5" Drive Bay (Pkg. of 5) .....	922-1652
Shield, CD-ROM Drive (Pkg. of 5).....	922-1650
Shield, Floppy/Hard Drive (Pkg. of 5).....	922-1648
Speaker.....	922-1639
Support Arm, Internal Chassis (Pkg. of 5) .....	922-1730
Support Foot, Internal Chassis (Pkg. of 5) .....	922-1661
Telecom Adapter, US/Canada/Hong Kong/Latin America.....	661-1703

## Specifications

**Table 6. Power Macintosh 7200/7500 Series Specifications**

<b>Processor</b>	<p>7200: PowerPC 601 RISC microprocessor running at 75 or 90 MHz. Built-in FPU and 32K cache. Requires system software version 7.5.2 or later with appropriate System Enabler.</p> <p>7250/120: PowerPC 601 RISC microprocessor running at 120 MHz. Built-in FPU and 32K cache. Requires system software version 7.5.3 or later with appropriate System Enabler.</p> <p>7500: PowerPC 601 RISC microprocessor running at 100 MHz. Built-in FPU. Requires system software version 7.5.2 or later with System Enabler version 1.2.</p>
<b>Memory</b>	<p>DRAM: 8 MB standard (7200/7500), expandable to 256 MB (7200/7250) or 512 MB (7500). Uses 168-pin, 64-bit, 70 ns or faster DRAM DIMMs.</p> <p>ROM: 4 MB ROM (may be installed in ROM SIMM slot, or soldered on the logic board).</p> <p>Cache: Supports 256K Level 2 cache DIMM (7200); supports 256K, 512K, or 1 MB Level 2 cache DIMM (7500).</p> <p>Clock/Calendar: CMOS custom circuitry with long-life battery.</p>
<b>Disk Storage</b>	<p>Hard Drive: 500 MB internal SCSI hard drive (7200/7500), 1.2 GB internal SCSI hard drive (7250), or 1 GB fast internal SCSI hard drive (7500 only).</p> <p>Floppy Drive: One Apple SuperDrive 1.4 MB floppy drive.</p> <p>CD-ROM Drive: One internal AppleCD 600i quadruple-speed drive.</p>
<b>I/O Devices</b>	<p>Keyboard: Standard, extended, or adjustable keyboard; keyboard draws 25-80 mA, depending on model type</p> <p>Mouse: ADB Mouse II; mouse draws up to 10 mA</p> <p>Microphone: Apple PlainTalk microphone standard</p>
<b>I/O Interfaces</b>	<p>SCSI: Dual-channel asynchronous SCSI interface; external channel supports up to seven SCSI devices. Internal channel supports a hard disk array (7500).</p> <p>Serial: Two RS-232/RS-422 serial ports compatible with LocalTalk and GeoPort cables; mini DIN-8 connectors.</p> <p>ADB: One Apple Desktop Bus port for a keyboard, mouse, etc.</p> <p>Ethernet: One AAUI and one 10Base-T Ethernet port (if cables are plugged into both ports, system defaults to 10Base-T).</p> <p>Expansion: Three PCI expansion slots, compatible with all PCI 2.0 specification-compliant cards with the addition of a Mac OS-specific software driver (not NuBus compatible).</p> <p>Sound: 16-bit stereo sound input and output ports.</p> <p>Video: Built-in DB-15 video connector on logic board; 24-bit video input connectors on AV module (7500).</p>

**Table 6. Power Macintosh 7200/7500 Series Specifications  
(Continued)**

<b>Video Support 7200</b>	VRAM expansion works as follows: 1 MB of VRAM is soldered to the board. For 2 MB, install one 1 MB VRAM SIMM in slot 1; For 4 MB, install three 1 MB VRAM DIMMs in slots 1, 2, and 3. Refer to the Video Support Table under 7200 Specifications on <i>Service Source</i> for detailed information on VRAM and pixel depths.
<b>Video Support 7500</b>	The Power Macintosh 7500/100 does not have any VRAM soldered on the logic board; VRAM DIMMs must be present to display any video. The computer comes with two 1 MB VRAM DIMMs installed. You can upgrade to 4 MB of VRAM by installing two more 1 MB VRAM DIMMs in the remaining slots; VRAM DIMMs must be installed in matching pairs and in paired slots. Refer to the Video Support Table under 7500 Specifications on <i>Service Source</i> for detailed information on VRAM and pixel depths.
<b>Electrical</b>	Line Voltage: 100-240 VAC, RMS single phase, automatically configured (7200/7500); 100-270 VAC, RMS single phase, automatically configured (7250) Frequency: 50-60 Hz, single phase Maximum Power: 150 W maximum, not including monitor The power supply has two voltage settings: 115 V and 230 V. The power supply must be set to 115 V in the U.S. (7200)
<b>Physical</b>	Height: 6.15 in. (15.6 cm) Width: 14.37 in. (36.5 cm) Depth: 16.93 in. (43.0 cm) Weight: 22 lb. (9.97 kg); weight varies depending on devices installed.
<b>Environmental</b>	Operating Temperature: 50 to 104° F (10 to 40° C) Storage Temperature: -40 to 116° F -40 to 47° C) Relative Humidity: 5% to 95% noncondensing Maximum Altitude: 10,000 ft. (3,048 m)



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## Troubleshooting Procedures

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### Resetting the Cuda Chip

Many system problems can be resolved by resetting the Cuda chip (see "Symptom/Cure Chart" for examples). Press the Cuda reset button on the logic board to reset the Cuda chip see Figure 38. If you continue to experience system problems, refer to Resetting the Logic Board below.

The Cuda is a microcontroller chip. Its function is to

- Turn system power on and off
- Manage system resets from various commands
- Maintain parameter RAM (PRAM)
- Manage the Apple Desktop Bus (ADB)
- Manage the real-time clock

---

### Resetting the Logic Board

Resetting the logic board can resolve many system problems (refer to "Symptom/Cure Charts" for examples). Whenever you have a unit that fails to power up, you should perform this procedure before replacing any modules.

#### Note

This procedure resets the computer's PRAM. Be sure to check the computer's time/date and other system parameter settings afterwards.

1. Unplug the computer.
2. Remove the logic board.
3. Using a small flat-blade screwdriver, pry open the latch at the end of the battery holder and lift off the battery holder cover.
4. Remove the battery from its holder.
5. Verify the power supply cable is disconnected from the logic board and then press the Power On button (see Figure 38).
6. Wait at least 10 minutes before replacing the battery. Make sure the battery is installed in the correct +/- direction.
7. Reassemble the computer and test the unit.

If this procedure resolves the problem, claim an adjustment on an SRO. If not, replace the defective component and DO NOT claim the adjustment procedure.



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## Symptom/Cure Chart

This Symptom/Cure Chart will help you diagnose specific symptoms related to your product. Because the most likely solution is listed first, try the first-listed solution. Verify whether or not the product continues to exhibit the symptom. If the symptom persists, try the next solution. (Note: If you have replaced a module, reinstall the original module before you proceed to the next solution.)

For additional assistance, contact Apple Technical Support.

### Power Supply

### Solutions

System doesn't power up

- 1 Check the power cable and cable connections between keyboard and logic board.
- 2 7200: Reseat ROM SIMM (if present).  
7500: Reseat processor card and ROM SIMM (if present).
- 3 Reset Cuda chip. (Refer to Resetting the Cuda Chip in "Troubleshooting Procedures.")
- 4 Reset logic board. (Refer to Resetting the Logic Board in "Troubleshooting Procedures.")
- 5 Replace power supply.
- 6 7500: Replace processor card.
- 7 Replace logic board.

### Error Chords

### Solutions

One-part error chord sounds during startup sequence

- 1 Boot from disk tools disk or startup CD-ROM disk.
- 2 Disconnect SCSI data cable from hard drive and reboot system. If startup sequence is normal, initialize hard drive. Test unit again with SCSI data cable connected. If error chord still sounds, replace hard drive.
- 3 Disconnect floppy drive cable from floppy drive and reboot system. If startup sequence is normal, replace floppy drive.
- 4 7500: Reseat processor card.
- 5 7500: Replace processor card.
- 6 Replace logic board. Retain customer's DIMMs.

Eight-part error chord (death chimes) sounds during startup sequence

- 1 Replace DRAM DIMMs one at a time to test DRAM. Replace any faulty DIMMs.
- 2 Replace logic board.

---

## System

## Solutions

Does not power on, screen is black, fan is not running and LED is not lit

- 1 Check power cables.
- 2 Plug monitor directly into wall socket, and verify that monitor has power
- 3 7200: Reseat ROM SIMM (if present).  
7500: Reseat ROM SIMM (if present) and processor card. The logic board must have a processor card installed to operate.
- 4 Reset Cuda chip. (Refer to Resetting the Cuda Chip in "Troubleshooting Procedures.")
- 5 Reset logic board. (Refer to Resetting the Logic Board in "Troubleshooting Procedures.")
- 6 Replace power cord.
- 7 Replace power supply.
- 8 Replace logic board. Retain customer's DIMMs.

Clicking, chirping, or thumping

- 1 Remove all PCI cards and test the unit. If problem does not occur with cards removed, begin replacing cards one at a time to determine which card is causing the problem. Replace problem card with known-good card.
- 2 Remove hard drive. If problem no longer occurs, replace hard drive with a known-good drive.
- 3 Replace power supply.
- 4 7200: Replace logic board. Retain customer's DIMMs.  
7500: Replace processor card.
- 5 7200: Replace floppy drive cable.  
7500: Replace logic board. Retain customer's DIMMs.
- 6 7200: Replace floppy drive.  
7500: Replace floppy drive cable
- 7 7500: Replace floppy drive.

System shuts down intermittently

- 1 Make sure air vents are clear. Thermal protection circuitry may shut down system. After 30 to 40 minutes, system should be OK.
- 2 Make sure power cord is firmly plugged in.
- 3 7200: Verify fan is plugged in and working (if present). Replace if necessary. (Note: Some 90 MHz versions of the Power Macintosh 7200 logic board have a fan that plugs into the logic board near the processor.)
- 4 Replace power cord.
- 5 Check battery.

System intermittently crashes or hangs

- 6 Reset Cuda chip. (Refer to Resetting the Cuda Chip in "Troubleshooting Procedures.")
  - 7 Reset logic board. (Refer to Resetting the Logic Board in "Troubleshooting Procedures.")
  - 8 Replace power supply.
  - 9 Replace processor card.
  - 10 Replace logic board. Retain customer's DIMMs.
- 1 Verify system software is version 7.5.2 or later.
  - 2 Verify DIMMs are noncomposite.
  - 3 Verify software is known-good. Do a clean install of the system software.
  - 4 Verify software is Power Macintosh compatible (contact developer). Also, try booting with extensions off to determine if there are system init problems.
  - 5 Clear parameter RAM. Hold down Command-Option-P-R during startup but before "Welcome to Macintosh" appears.
  - 6 Remove all DRAM DIMMs and try replacing them one at a time to test. Replace any bad DIMMs.
  - 7 7500: Replace processor card.
  - 8 Replace logic board. Retain DIMMs.

During startup, following message is displayed, "This startup disk will not work on this Macintosh model...."

- 1 Verify that startup disk is good.
- 2 Verify system software is version 7.5.2 or later.
- 3 Do a clean install of system software.

## Video

Boot tone is present and screen lights up, but nothing is displayed on screen

## Solutions

- 1 Check status of PRAM battery. If less than 3.6V replace battery.
- 2 Reset Cuda chip. (Refer to Resetting the Cuda Chip in "Troubleshooting Procedures.")
- 3 Reset logic board. (Refer to Resetting the Logic Board in "Troubleshooting Procedures.")
- 4 Replace monitor cable.
- 5 Test with known-good monitor. Replace monitor if necessary. Refer to appropriate monitor manual to troubleshoot defective monitor.
- 6 7500: Replace processor card.
- 7 Replace logic board. Retain customer's DIMMs.

Screen is black, boot tone is present, drive operates, fan is running, and LED is lit

- 1 Adjust brightness on monitor.
- 2 Clear parameter RAM. Hold down Command-Option-P-R during startup but before "Welcome to Macintosh" appears.
- 3 Reset Cuda chip. (Refer to Resetting the Cuda Chip in "Troubleshooting Procedures.")
- 4 Reset logic board. (Refer to Resetting the Logic Board in "Troubleshooting Procedures.")
- 5 Replace monitor cable.
- 6 Remove all DRAM DIMMs and try replacing them one at a time to test. Replace any bad DIMMs.
- 7 Test with known-good monitor. Replace monitor if necessary. Refer to appropriate monitor manual to troubleshoot defective monitor.
- 8 7500: Replace processor card.
- 9 Replace logic board. Retain customer's DIMMs.

Screen is black, no boot tone, drive does not operate, but fan is running and LED is lit

- 1 Reset Cuda chip. (Refer to Resetting the Cuda Chip in "Troubleshooting Procedures.")
- 2 Reset logic board. (Refer to Resetting the Logic Board in "Troubleshooting Procedures.")
- 3 Remove all DRAM DIMMs and try replacing them one at a time to test. Replace any bad DIMMs.
- 4 7500: Replace processor card.
- 5 Replace logic board. Retain customer's DIMMs.
- 6 Replace power supply.

## Floppy Drive

Internal floppy drive does not operate

## Solutions

- 1 Replace floppy disk with known-good disk.
- 2 Replace floppy drive cable.
- 3 Replace floppy drive.
- 4 7500: Replace processor card.
- 5 Replace logic board. Retain customer's DIMMs.

During system startup, disk ejects; display shows icon with blinking "X"

- 1 Replace disk with known-good system disk.
- 2 Replace floppy drive cable.
- 3 Replace floppy drive.
- 4 7500: Replace processor card.
- 5 Replace logic board. Retain customer's DIMMs.

Does not eject disk	<ol style="list-style-type: none"> <li>1 Switch off computer. Hold mouse button down while you switch computer on.</li> <li>2 Manually eject disk to insure the disk is not damaged.</li> <li>3 Replace floppy drive cable.</li> <li>4 Replace floppy drive.</li> <li>5 7500: Replace processor card.</li> <li>6 Replace logic board. Retain customer's DIMMs.</li> </ol>
Attempts to eject disk, but doesn't	<ol style="list-style-type: none"> <li>1 Reseat floppy drive bezel and drive so bezel slot aligns correctly with drive.</li> <li>2 Replace floppy drive.</li> </ol>
MS-DOS drive does not recognize a disk formatted on a 1.4 MB drive	To read and write files with either MS-DOS or 1.4 MB drive, format all disks with MS-DOS drive first.
Internal floppy drive runs continuously	<ol style="list-style-type: none"> <li>1 Replace disk with known-good floppy disk.</li> <li>2 Replace floppy drive cable.</li> <li>3 Replace floppy drive.</li> <li>4 7500: Replace processor card.</li> <li>5 Replace logic board. Retain customer's DIMMs.</li> </ol>
<b>Hard Drive</b>	<b>Solutions</b>
Single internal hard drive does not operate; drive doesn't spin	<ol style="list-style-type: none"> <li>1 7500: Replace hard drive power cable.</li> <li>2 Replace hard drive. If problem is resolved, reinstall SCSI device driver and system software.</li> <li>3 Replace power supply.</li> </ol>
No internal SCSI drives operate	<ol style="list-style-type: none"> <li>1 Verify there are no duplicate SCSI device addresses.</li> <li>2 Disconnect external SCSI devices and check for proper termination. Only last device in SCSI chain should be terminated.</li> <li>3 Replace SCSI data cable.</li> <li>4 Replace power supply.</li> <li>5 7500: Replace processor card.</li> <li>6 Replace logic board. Retain customers' DIMMs.</li> </ol>
Drive does not appear on the desktop	<ol style="list-style-type: none"> <li>1 Verify there are no duplicate SCSI device addresses.</li> <li>2 Update SCSI device driver using Drive Setup. Check drive's directory structure using Disk First Aid.</li> <li>3 Replace SCSI hard drive cable.</li> </ol>



Works with internal or external SCSI devices but not with both

- 4 If drive is not initialized, use Drive Setup to initialize.
- 5 Replace with known-good hard drive.
- 6 If hard drive still doesn't work, switch back to original hard drive and replace logic board.

- 1 Verify there are no duplicate SCSI device addresses.
- 2 Replace terminator on external SCSI device.
- 3 Verify that SCSI device at end of internal SCSI data cable is only device terminated.
- 4 Refer to appropriate manual to troubleshoot defective external device.

## Peripherals

## Solutions

Cursor does not move

- 1 Check mouse connection.
- 2 Inspect inside of mouse for buildup of dirt or other contaminants. Clean mouse if necessary.
- 3 If mouse was connected to keyboard, connect mouse to computer ADB port instead. If mouse works, replace keyboard.
- 4 Replace ADB cable.
- 5 If mouse does not work in any ADB port on computer, replace mouse.
- 6 7500: Replace processor card
- 7 Replace logic board. Retain customer's DIMMs.

Cursor moves, but clicking mouse button has no effect

- 1 Boot from floppy or bootable CD.
- 2 Replace mouse.
- 3 Replace logic board. Retain customer's DIMMs.

Double-click doesn't open application, disk, or server

- 1 Remove duplicate system folders.
- 2 Clear parameter RAM. Hold down Command-Option-P-R during startup but before "Welcome to Macintosh" appears.
- 3 If mouse was connected to keyboard, connect mouse to computer ADB port instead. If mouse works, replace keyboard. If mouse does not work in any ADB port on computer, replace mouse.
- 4 Replace logic board. Retain customer's DIMMs.

No response to any key on keyboard

- 1 Check keyboard connection to ADB port.
- 2 Replace keyboard cable.
- 3 Replace keyboard.
- 4 Replace logic board. Retain customer's DIMMs.

---

Known-good serial printer  
does not work

- 1 Verify you have correct version of system software.
- 2 Verify that Chooser is set correctly.
- 3 Reinstall correct printer drivers.
- 4 Do clean install of system software.
- 5 Replace printer interface cable.
- 6 Replace logic board. Retain customer's DIMMs.

Known-good network printer  
does not print

- 1 Check network connections.
- 2 Verify you have correct version of system software.
- 3 Verify that Chooser is set correctly.
- 4 Does printer show up in Chooser? If so, do clean install of system software and/or network and printer software.
- 5 Replace logic board. Retain customer's DIMMs.

#### **CD-ROM Drive**

#### **Solutions**

CD-ROM drive does not work

- 1 Try using known-good compact disc.
- 2 Replace CD-ROM drive mechanism.

Macintosh does not display  
CD-ROM icon once CD is  
inserted in drive

- 1 Verify that CD-ROM software is installed.
- 2 Replace CD-ROM drive mechanism.
- 3 Replace SCSI data cable.

#### **Miscellaneous**

#### **Solutions**

No sound from speaker

- 1 Verify that volume setting in Control Panel is 1 or above.
- 2 Clear parameter RAM. Hold down Command-Option-P-R during startup but before "Welcome to Macintosh" appears.
- 3 Verify speaker is plugged into logic board.
- 4 Replace speaker.
- 5 Replace logic board. Retain customer's DIMMs.

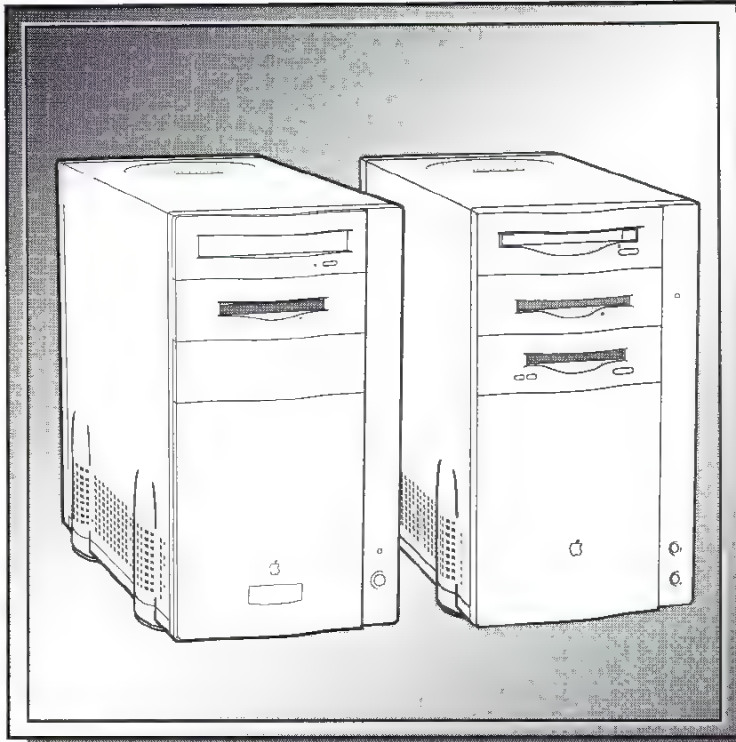
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Transferring/printing large files across certain repeaters causes Power Macintosh 7200/90 to hang or exhibit poor performance or Power Macintosh 7200/90 locks up or times out when running under TCP

- 1 Verify computer is Power Macintosh 7200/90 and it is attached to Ethernet network.
- 2 Test to see if problem occurs on other systems (preferably Power Macintosh 7200/75, 7500, 8500, or 9500 computers that utilize the Open Transport networking protocol).
  - a. If yes, difficulty may be related to software or network to which computer is attached. Perform basic software and network troubleshooting to pinpoint problem.
  - b. If no, difficulty may be related to Ethernet clock jitter. Refer to logic board identification instructions on *Service Source* to determine whether or not logic board has been revised. If logic board is a revised module, problem may have to do with the network. If logic board has not been revised, replace it in at least one of the systems to verify whether a revised board solves the problem.



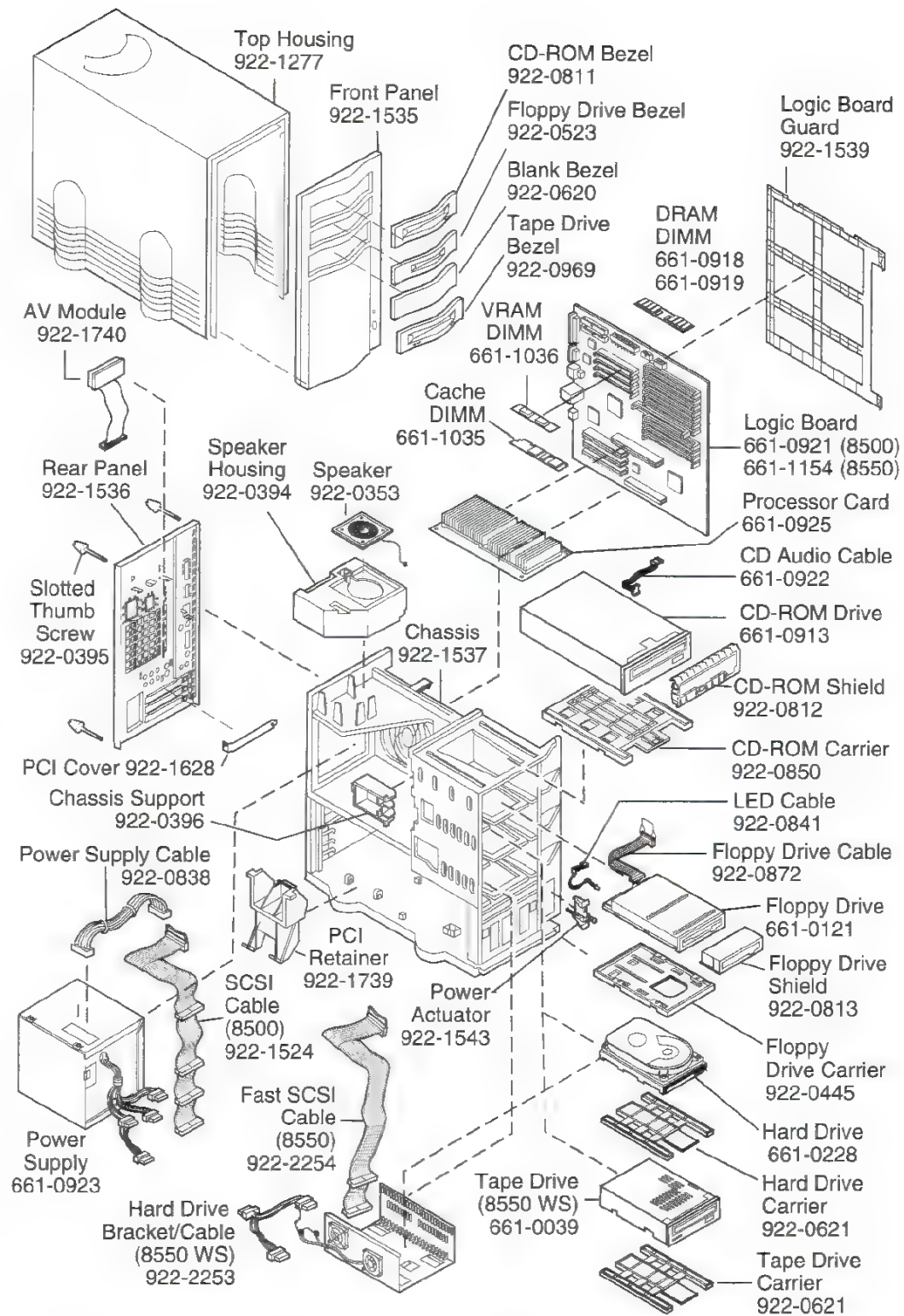
# Power Macintosh 8500 Workgroup Server 8550



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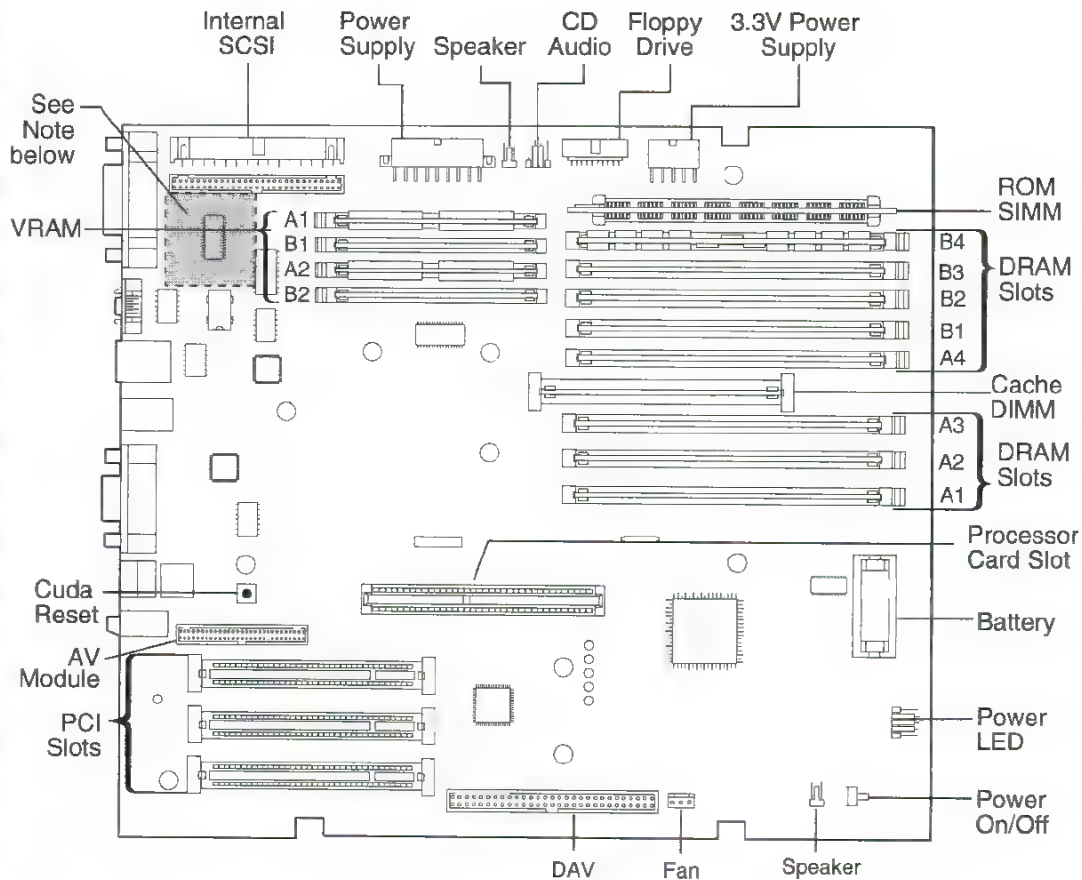


## Exploded View



*This is a generic representation of a product family. Configurations may vary.*

**Figure 40. Power Macintosh 8500/8550 Exploded View**



Note: The Workgroup Server 8550 logic board can be identified by the Ethernet chip on the bottom side if the logic board near the external SCSI port.

## Processor Card

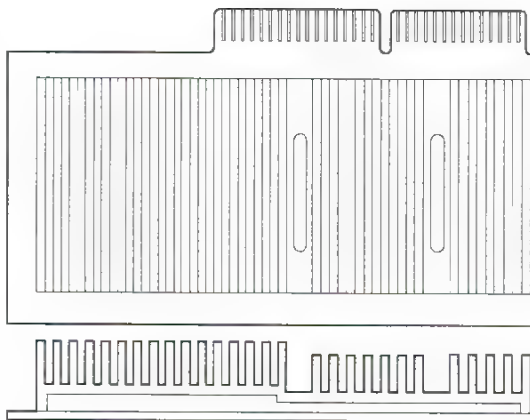
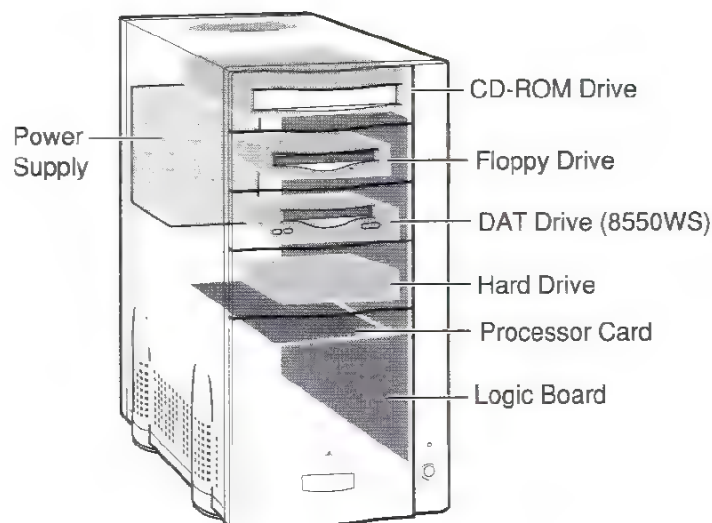
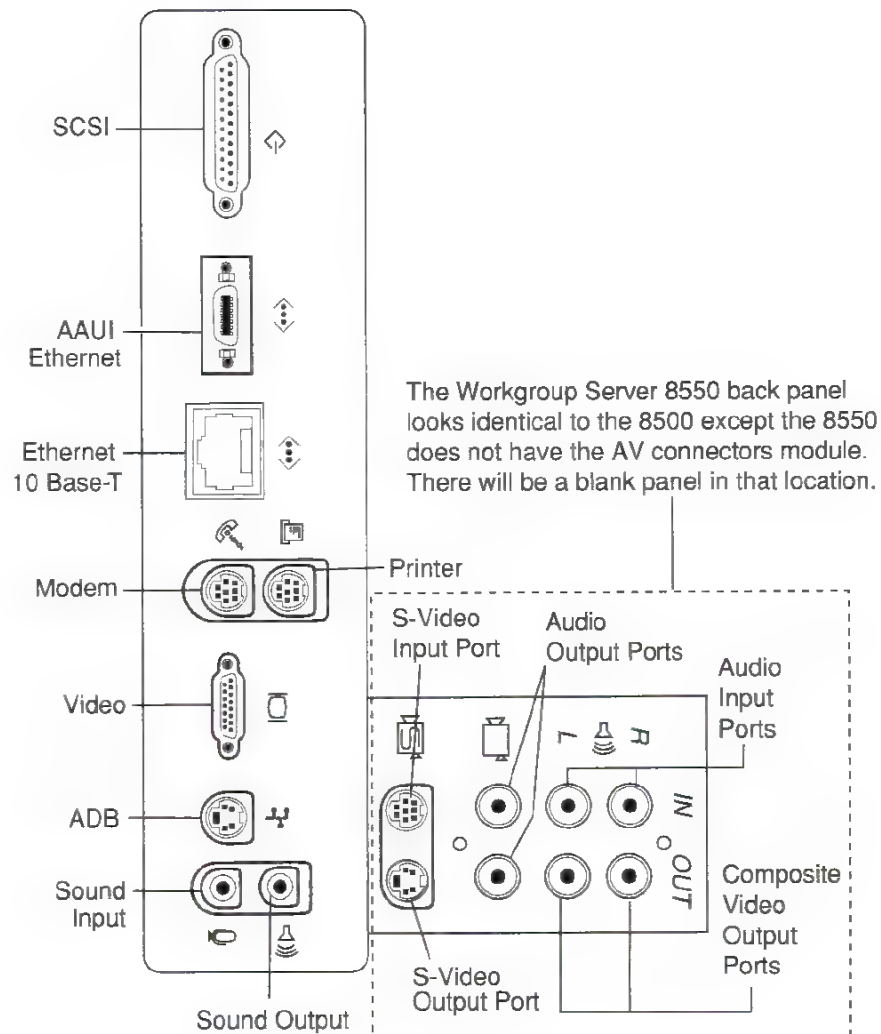


Figure 41. Power Macintosh 8500/8550 Logic Board and Processor Card

## Back Panel and Locator View



**Figure 42. Power Macintosh 8500/8550 Back Panel and Locator View**

## Parts List

Actuator, Power, (Pkg. of 10).....	922-1543
AV Module with Video Out .....	922-1740
Battery, Lithium, without Leads.....	922-1262
Bezel, Blank, Version 2 .....	922-0620
Bezel, CD-ROM Drive, Trayloading (Pkg. of 5).....	922-0811
Bezel, Floppy Drive, Manual Insert .....	922-0523
Bezel, Tape Drive (Pkg. of 5) .....	922-0969
Board, Logic, Power Macintosh 8500 .....	661-0921
Board, Logic, Workgroup Server 8550 .....	661-1154
Brace, Chassis Support.....	922-0396
Bracket, Hard Drives .....	922-2253
Cable, CD Audio (Pkg. of 5) .....	922-0724
Cable, Floppy Drive .....	922-0872
Cable, Hard Drive to CD-ROM Drive, SCSI.....	922-1524
Cable, Hard Drive/CD-ROM Drive/DAT, SCSI (WS 8550).....	922-2254
Cable, LED .....	922-0841
Cable, Power Supply to Logic Board, 22 pin.....	922-0838
Card, 604 Processor, 120 MHz (Replaced by 661-0925) .....	661-0922
Card, 604 Processor, 120 MHz (Replaces 661-0922) .....	661-0925
Card, 604 Processor, 132 MHz, Rev. B .....	661-1157
Carrier, CD-ROM Drive .....	922-0850
Carrier, Floppy Drive, Manual Insert.....	922-0445
Carrier, Hard Drive/Tape Drive, 3.5" .....	922-0621
CD-ROM Drive, AppleCD 600i.....	661-0913
Chassis, Internal.....	922-1537
Cover, Battery Holder .....	520-0344
Cover, Blank, PCI Card (Pkg. of 10) .....	922-1628
DIMM, Cache, 256K, 11 ns, 160 pin.....	661-1035
DIMM, Cache, 512K, 160 pin .....	661-0927
DIMM, DRAM, 8 MB, 70 ns, 168 pin .....	661-0918
DIMM, DRAM, 16 MB, 70 ns, 168 pin .....	661-0919
DIMM, VRAM, 1 MB, 70 ns, 112 pin.....	661-1036
Floppy Drive, Apple SuperDrive, 1.4 MB, Manual Insert.....	661-0121
Guard, Logic Board.....	922-1539
Hard Drive, 1 GB, 3.5", SCSI .....	661-0228
Hard Drive, 2 GB, 3.5", SCSI (8500/120 Only).....	661-1076
Hard Drive, 2 GB, 3.5", SCSI (8550 Only) .....	661-0892
Housing, Speaker .....	922-0394
Housing, Top .....	922-1277
Keyboard, AppleDesign.....	661-0310
Label, FCC, Power Macintosh 8500 (Pkg. of 10) .....	922-1544
Label, Product ID, Power Macintosh 8500/120 (Pkg. of 10) .....	922-1545
Label, Product ID, WS 8550/132 (Pkg. of 10).....	922-2219



Microphone, Apple PlainTalk .....	922-0867
Mouse II, Apple Desktop Bus, Version B.....	661-0104
Panel, Front, without Bezel.....	922-1535
Panel, Rear.....	922-1536
Power Cord, Smoke.....	590-0760
Power Supply, 225 W, 3.3 V .....	661-0923
Retainer, PCI Card .....	922-1739
Screw, M2.5x8mm (Pkg. of 10) .....	922-0077
Screw, M3.5x0.6x10mm (Pkg. of 10) .....	922-0119
Screw, M3x8mm, Pan Head, Philips (Pkg. of 10).....	922-0401
Screw, Net, Sems, M3x.5, Pan (Pkg. of 25).....	922-0895
Screw, Sems, 6-32 x .250 (Pkg. of 10).....	922-2224
Screw, Sems 6-32x.313 CRS.....	440-6105
Screw, Tap, M3.5x1.57x7mm, PT, Torx (Pkg. of 10).....	922-0117
Screw, Thumb Slotted, 6-32 (Pkg. of 4) .....	922-0395
Shield, CD-ROM Drive, Trayloading (Pkg. of 5) .....	922-0812
Shield, Floppy Drive (Pkg. of 5) .....	922-0813
Speaker.....	922-0353
Tape Drive, DAT, DDS-2, 120 M.....	661-0039
Telecom Adapter, US/Canada/Hong Kong/Latin America.....	661-1703



## Specifications

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**Table 7. Power Macintosh 8500/8550 Specifications**

<b>Processor</b>	8500: PowerPC 604 RISC microprocessor running at 120 MHz; built-in FPU and 32K cache; requires system software version 7.5.2 or later with appropriate System Enabler 8550: Power PC 604 RISC microprocessor running at 132 MHz; built-in FPU and 32K cache; requires system software version 7.5.3 or later with appropriate System Enabler
<b>Memory</b>	DRAM: 8500: 16 MB standard, expandable to 512 MB. Uses 168-pin, 64-bit, 70 ns or faster DRAM DIMMs. 8550: 24 MB standard; expandable to 512 MB. Uses 168-pin, 64-bit, 70 ns or faster DRAM DIMMs. ROM: 4 MB ROM (may be installed in ROM SIMM slot, or soldered on the logic board) Cache: 8500: 256K Level 2 cache. 8550: 512K Level 2 cache. Clock/Calendar: CMOS custom circuitry with long-life battery
<b>Disk Storage</b>	Hard Drive: 8500: 1 GB or 2 GB fast internal SCSI hard drive. 8550: 2 GB fast internal SCSI hard drive. Supports drive array with dual hard drive bracket Floppy Drive: One Apple SuperDrive 1.4 MB floppy drive CD-ROM Drive: One internal AppleCD 600i quadruple-speed CD-ROM drive
<b>I/O Interfaces</b>	SCSI: Dual-channel asynchronous SCSI interface; external channel supports up to seven SCSI devices; internal channel supports a hard disk array Serial: Two RS-232/RS-422 serial ports compatible with LocalTalk and GeoPort cables; mini DIN-8 connectors ADB: One Apple Desktop Bus port for a keyboard, mouse, etc. Ethernet: One AAUI and one 10Base-T Ethernet port (if cables are plugged into both ports, system defaults to 10Base-T) Expansion: Three PCI expansion slots, compatible with all PCI 2.0 specification-compliant cards with the addition of Mac OS-specific software driver (not NuBus compatible) Sound: 16-bit stereo sound input and output ports Video: Built-in DB-15 video connector on logic board; 24-bit video input and output connectors on AV module
<b>I/O Devices</b>	Keyboard: Standard, extended, or adjustable keyboard; keyboard draws 25-80 mA, depending on model type Mouse: ADB Mouse II; mouse draws up to 10 mA Microphone: Apple PlainTalk microphone standard

**Table 7. Power Macintosh 8500/8550 Specifications (Continued)**

<b>Video</b>	Monitor Display Size: Pixel Depths – 2 MB VRAM: 512 by 384: 8, 16, 32 640 by 480: 8, 16, 32 768 by 576: 8, 16, 32 800 by 600: 8, 16, 32 832 by 624: 8, 16, 32 1024 by 768: 8, 16 1152 by 870: 8, 16 1280 by 960: 8 1280 by 1024: 8 Monitor Display Size: Pixel Depths – 4 MB VRAM 512 by 384: 8, 16, 32 640 by 480: 8, 16, 32 768 by 576: 8, 16, 32 800 by 600: 8, 16, 32 832 by 624: 8, 16, 32 1024 by 768: 8, 16, 32 1152 by 870: 8, 16 1280 by 960: 8, 16 1280 by 1024: 8, 16
<b>Electrical</b>	Line Voltage: 100–240 VAC, RMS single phase, automatically configured Frequency: 50–60 Hz, single phase Maximum Power: DC Power: 225 W, not including monitor. AC Power: 340 W maximum continuous; 520 W peak input
<b>Physical</b>	Height: 14 in. (35.6 cm) Width: 7.7 in. (19.6 cm) Depth: 15.75 in. (40.0 cm) Weight: 25 lb. (11.3 kg); weight varies depending on devices installed
<b>Environmental</b>	Operating Temperature: 50 to 104° F (10 to 40° C) Storage Temperature: -40 to 116° F (-40 to 47° C) Relative Humidity: 5% to 95% noncondensing Maximum Altitude: 10,000 ft. (3,048 m)

### Resetting the Cuda Chip

Many system problems can be resolved by resetting the Cuda chip (see "Symptom/Cure Chart" for examples). Press the Cuda reset button on the logic board to reset the Cuda chip (see Figure 41). If you continue to experience system problems, refer to "Resetting the Logic Board" below.

The Cuda is a microcontroller chip. Its function is to

- Turn system power on and off
- Manage system resets from various commands
- Maintain parameter RAM (PRAM)
- Manage the Apple Desktop Bus (ADB)
- Manage the real-time clock

### Resetting the Logic Board

Resetting the logic board can resolve many system problems (refer to "Symptom/Cure Chart" for examples). Whenever you have a unit that fails to power up, you should follow this procedure before replacing any modules.

#### Note

This procedure resets the computer's PRAM. Be sure to check the computer's time/date and other system parameter settings afterwards.

1. Unplug the computer.
2. Remove the logic board.
3. Using a small flat-blade screwdriver, pry open the latch at the end of the battery holder and lift off the battery holder cover.
4. Remove the battery from its holder.
5. Verify the power supply cable is disconnected from the logic board and then press the Power On button (see Figure 41).
6. Wait at least 10 minutes before replacing the battery. Make sure the battery is installed in the correct +/- direction.
7. Reassemble the computer and test the unit.

If this adjustment resolves the problem, claim an adjustment on an SRO. If not, replace the defective component and DO NOT claim the adjustment procedure.

---

## Symptom/Cure Chart

This Symptom/Cure Chart will help you diagnose specific symptoms related to your product. Because the most likely solution is listed first, try the first-listed solution. Verify whether or not the product continues to exhibit the symptom. If the symptom persists, try the next solution. (Note: If you have replaced a module, reinstall the original module before you proceed to the next solution.)

For additional assistance, contact Apple Technical Support.

### Power Supply

#### Solutions

System doesn't power up

- 1 Verify that the keyboard and cable are good.
- 2 Ensure that the power cord is connected to known-good source.
- 3 Reseat processor card and ROM SIMM (if present).
- 4 Reset Cuda chip. (Refer to Resetting the Cuda Chip in "Troubleshooting Procedures.")
- 5 Reset logic board. (Refer to Resetting the Logic Board in "Troubleshooting Procedures.")
- 6 Replace power supply.
- 7 Replace processor card.
- 8 Replace logic board.

### Error Chords

#### Solutions

One-part error chord sounds during startup sequence

- 1 Disconnect SCSI data cable from hard drive and reboot system. If startup sequence is normal, initialize hard drive. Test unit again with SCSI data cable connected. If error chord still sounds, replace hard drive.
- 2 Disconnect floppy drive cable from floppy drive and reboot system. If startup sequence is normal, replace floppy drive.
- 3 Reseat processor card.
- 4 Replace processor card.
- 5 Replace logic board. Retain customer's DIMMs.

Eight-part error chord (death chimes) sounds during startup sequence

- 1 Replace DRAM DIMMs one at a time to test DRAM. Replace any faulty DIMMs.
- 2 Replace logic board.

## System

## Solutions

Does not power on, screen is black, fan is not running and LED is not lit

- 1 Check power cables.
- 2 Plug monitor directly into wall socket, and verify that monitor has power.
- 3 Reseat ROM SIMM (if present) and processor card. The logic board must have a processor card installed to operate.
- 4 Reset Cuda chip. (Refer to Resetting the Cuda Chip in "Troubleshooting Procedures.")
- 5 Reset logic board. (Refer to Resetting the Logic Board in "Troubleshooting Procedures.")
- 6 Replace power cord.
- 7 Replace power supply.
- 8 Replace processor card.
- 9 Replace logic board. Retain customer's DIMMs.

Clicking, chirping, or thumping

- 1 Remove all PCI cards and test the unit. If problem does not occur with cards removed, begin replacing cards one at a time to determine which card is causing the problem. Replace problem card with known-good card.
- 2 Remove hard drive. If problem no longer occurs, replace hard drive with a known-good drive.
- 3 Replace power supply.
- 4 Replace processor card.
- 5 Replace logic board. Retain customer's DIMMs.
- 6 Replace floppy drive cable.
- 7 Replace floppy drive.

System shuts down intermittently

- 1 Make sure air vents are clear. Thermal protection circuitry may shut down system. After 30 to 40 minutes, system should be OK.
- 2 Make sure power cord is firmly plugged in.
- 3 Replace power cord.
- 4 Check battery.
- 5 Reset Cuda chip. (Refer to Resetting the Cuda Chip in "Troubleshooting Procedures.")
- 6 Reset logic board. (Refer to Resetting the Logic Board in "Troubleshooting Procedures.")
- 7 Replace power supply.
- 8 Replace processor card.
- 9 Replace logic board. Retain customer's DIMMs.



System intermittently crashes or hangs

- 1 Verify system software is version 7.5.2 or later.
- 2 Verify DIMMs are noncomposite.
- 3 Verify software is known-good. Do a clean install of the system software.
- 4 Verify software is Power Macintosh 8500 compatible (contact developer). Also, try booting with extensions off to determine if there are system init problems.
- 5 Clear parameter RAM. Hold down Command-Option-P-R during startup but before "Welcome to Macintosh" appears.
- 6 Remove all DRAM DIMMs and try replacing them one at a time to test. Replace any bad DIMMs.
- 7 Replace processor card.
- 8 Replace logic board. Retain DIMMs.

During startup, following message is displayed, "This startup disk will not work on this Macintosh model...."

- 1 Verify that startup disk is good.
- 2 Verify system software is version 7.5.2 or later.
- 3 Do a clean install of the system software.

## Video

Screen is black, boot tone is present, drive operates, fan is running, and LED is lit

## Solutions

- 1 Adjust brightness on monitor.
- 2 Clear parameter RAM. Hold down Command-Option-P-R during startup but before "Welcome to Macintosh" appears.
- 3 Reset Cuda chip. (Refer to Resetting the Cuda Chip in "Troubleshooting Procedures.")
- 4 Reset logic board. (Refer to Resetting the Logic Board in "Troubleshooting Procedures.")
- 5 Replace monitor cable.
- 6 Remove all DRAM DIMMs and try replacing them one at a time to test. Replace any bad DIMMs.
- 7 Test with known-good monitor. Replace monitor if necessary. Refer to appropriate monitor manual to troubleshoot defective monitor.
- 8 Replace processor card.
- 9 Replace logic board. Retain customer's DIMMs.

Screen is black, no boot tone and drive does not operate, but fan is running and LED is lit

- 1 Reset Cuda chip. (Refer to Resetting The Cuda Chip in "Troubleshooting Procedures.")
- 2 Reset logic board. (Refer to Resetting the Logic Board in "Troubleshooting Procedures.")
- 3 Remove all DRAM DIMMs and try replacing them one at a time to test. Replace any bad DIMMs.

Boot tone is present and screen lights up, but nothing is displayed on screen

- 4 Replace processor card.
  - 5 Replace logic board. Retain customer's DIMMs.
  - 6 Replace power supply.
- 
- 1 Reset Cuda chip. (Refer to Resetting the Cuda Chip in "Troubleshooting Procedures.")
  - 2 Reset logic board. (Refer to Resetting the Logic Board in "Troubleshooting Procedures.")
  - 3 Check that the battery is 3.6V or higher. If not, replace it.
  - 4 Replace monitor cable.
  - 5 Test with known-good monitor. Replace monitor if necessary. Refer to appropriate monitor manual to troubleshoot defective monitor.
  - 6 Replace processor card.
  - 7 Replace logic board. Retain customer's DIMMs.

Video display distorted on Power Macintosh 8500 with DAV card installed.

Symptom occurs when an add-in card attached to the DAV connector requires a mode configuration under which the add-in card controls most of the signal lines (Mode 2). Replace installed logic board with logic board that supports DAV cards. To identify Power Macintosh 8500 logic boards that support DAV cards, look for one of the following:

- Part number 820-0752 silk-screened on the logic board.
- A computer with serial number CK548XXXXX, SG548XXXXX, FC548XXXXX, XB548XXXXX or greater.
- A logic board with the wiring scenario shown in *Service Source* (Path: Power Macintosh/Troubleshooting/Symptom Charts/Video) Note: The resistors shown in the illustration are on the underside of the logic board between the microprocessor slot and the battery and near location U40.

## Floppy Drive

Internal floppy drive does not operate

## Solutions

- 1 Replace floppy disk with known-good disk.
- 2 Replace floppy drive cable.
- 3 Replace floppy drive.
- 4 Replace processor card.
- 5 Replace logic board. Retain customer's DIMMs.

During system startup, disk ejects; display shows icon with blinking "X"

- 1 Replace disk with known-good system disk.
- 2 Replace floppy drive cable.
- 3 Replace floppy drive.
- 4 Replace processor card.
- 5 Replace logic board. Retain customer's DIMMs.

Does not eject disk

- 1 Switch off computer. Hold mouse button down while you switch computer on.
- 2 Attempt to manually eject diskette using a straightened paper clip.
- 3 Replace floppy drive cable.
- 4 Replace floppy drive.
- 5 Replace processor card.
- 6 Replace logic board. Retain customer's DIMMs.

Attempts to eject disk, but doesn't

- 1 Reseat floppy drive bezel and drive so bezel slot aligns correctly with drive.
- 2 Replace floppy drive.

Internal floppy drive runs continuously

- 1 Replace disk with known-good floppy disk.
- 2 Replace floppy drive cable.
- 3 Replace floppy drive.
- 4 Replace processor card.
- 5 Replace logic board. Retain customer's DIMMs.

MS-DOS drive does not recognize a disk formatted on a 1.4 MB drive

To read and write files with either MS-DOS or 1.4 MB drive, format all disks with MS-DOS drive first.

## Hard Drive

Single internal hard drive does not operate; drive doesn't spin

- 1 Replace hard drive power cable.
- 2 Replace hard drive. If problem is resolved, reinstall SCSI device driver and system software.
- 3 Replace power supply.

No internal SCSI drives operate

- 1 Verify there are no duplicate SCSI device addresses.
- 2 Disconnect external SCSI devices and check for proper termination. Only last device in SCSI chain should be terminated.
- 3 Replace SCSI data cable.
- 4 Replace power supply.
- 5 Replace processor card.
- 6 Replace logic board. Retain customer's DIMMs.

## Solutions

Drive does not appear on the desktop

- 1 Verify there are no duplicate SCSI device addresses.
- 2 Update the SCSI device driver using Drive Setup. Run Disk First Aid to verify the condition of the drive's directory structure.
- 3 Replace the SCSI hard drive cable.
- 4 If drive is not initialized, use Drive Setup to initialize.
- 5 Replace with known-good hard drive.
- 6 If the hard drive still doesn't work, switch back to the original hard drive and replace the logic board.

Works with internal or external SCSI devices but not with both

- 1 Verify there are no duplicate SCSI device addresses.
- 2 Replace terminator on external SCSI device.
- 3 Verify that SCSI device at end of internal SCSI data cable is only device terminated.
- 4 Refer to appropriate manual to troubleshoot defective external device.

## Peripherals

Cursor does not move

## Solutions

- 1 Check mouse connection.
- 2 Inspect inside of mouse for buildup of dirt or other contaminants. Clean mouse if necessary.
- 3 If mouse was connected to keyboard, connect mouse to computer ADB port instead. If mouse works, replace keyboard.
- 4 Replace ADB cable.
- 5 If mouse does not work in any ADB port on computer, replace mouse.
- 6 If known-good mouse does not work in any ADB port on computer, replace logic board. Retain customer's DIMMs.
- 7 Replace processor card.

Cursor moves, but clicking mouse button has no effect

- 1 Boot from floppy or bootable CD.
- 2 Replace mouse.
- 3 Replace logic board. Retain customer's DIMMs.

Double-click doesn't open application, disk, or server

- 1 Remove duplicate system folders.
- 2 Clear parameter RAM. Hold down Command-Option-P-R during startup but before "Welcome to Macintosh" appears.
- 3 If mouse was connected to keyboard, connect mouse to computer ADB port instead. If mouse works, replace keyboard. If mouse does not work in any ADB port on computer, replace mouse.
- 4 Replace logic board. Retain customer's DIMMs.

No response to any key on keyboard

- 1 Check keyboard connection to ADB port.
- 2 Replace keyboard cable.
- 3 Replace keyboard.
- 4 Replace logic board. Retain customer's DIMMs.

Known-good serial printer does not work

- 1 Verify you have correct version of system software.
- 2 Verify that Chooser is set correctly.
- 3 Reinstall correct printer drivers.
- 4 Do clean install of system software.
- 5 Replace printer interface cable.
- 6 Replace logic board. Retain customer's DIMMs.

Known-good network printer does not print

- 1 Check network connections.
- 2 Verify you have correct version of system software.
- 3 Verify that Chooser is set correctly.
- 4 Does printer show up in Chooser? If so, do clean install of system software and/or network and printer software.
- 5 Replace logic board. Retain customer's DIMMs.

### **CD-ROM Drive**

CD-ROM drive does not work

- 1 Try using known-good compact disc.
- 2 Replace CD-ROM drive mechanism.

Macintosh does not display CD-ROM icon once CD is inserted in drive

- 1 Verify that CD-ROM software is installed.
- 2 Replace CD-ROM drive mechanism.
- 3 Replace SCSI data cable.

### **Solutions**



**Miscellaneous**

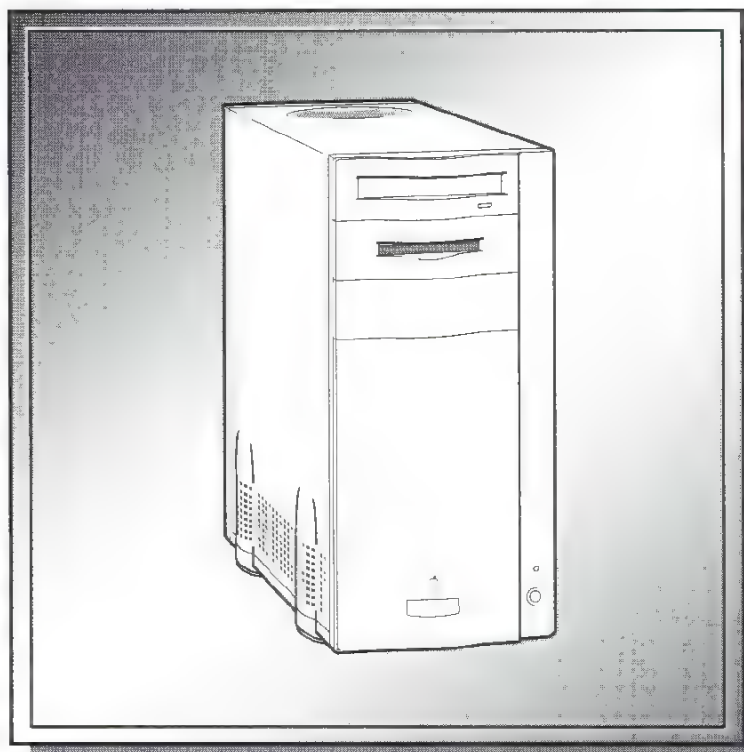
No sound from speaker

**Solutions**

- 1 Verify that volume setting in Control Panel is 1 or above.
- 2 Clear parameter RAM. Hold down Command-Option-P-R during startup but before "Welcome to Macintosh" appears. Verify speaker is plugged into logic board.
- 3 Replace speaker.
- 4 Replace logic board. Retain customer's DIMMs.



# Power Macintosh 9500



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## Exploded View

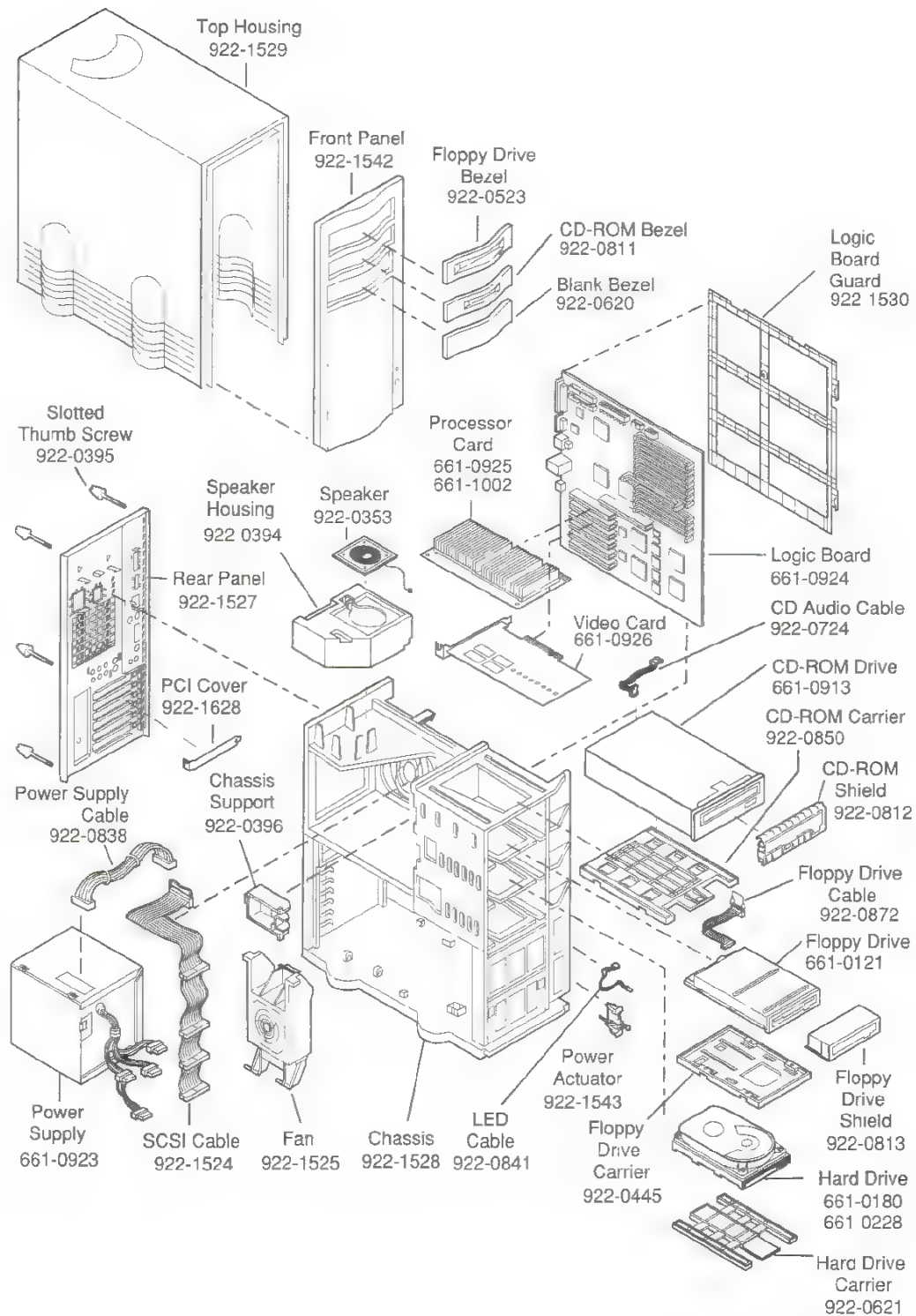
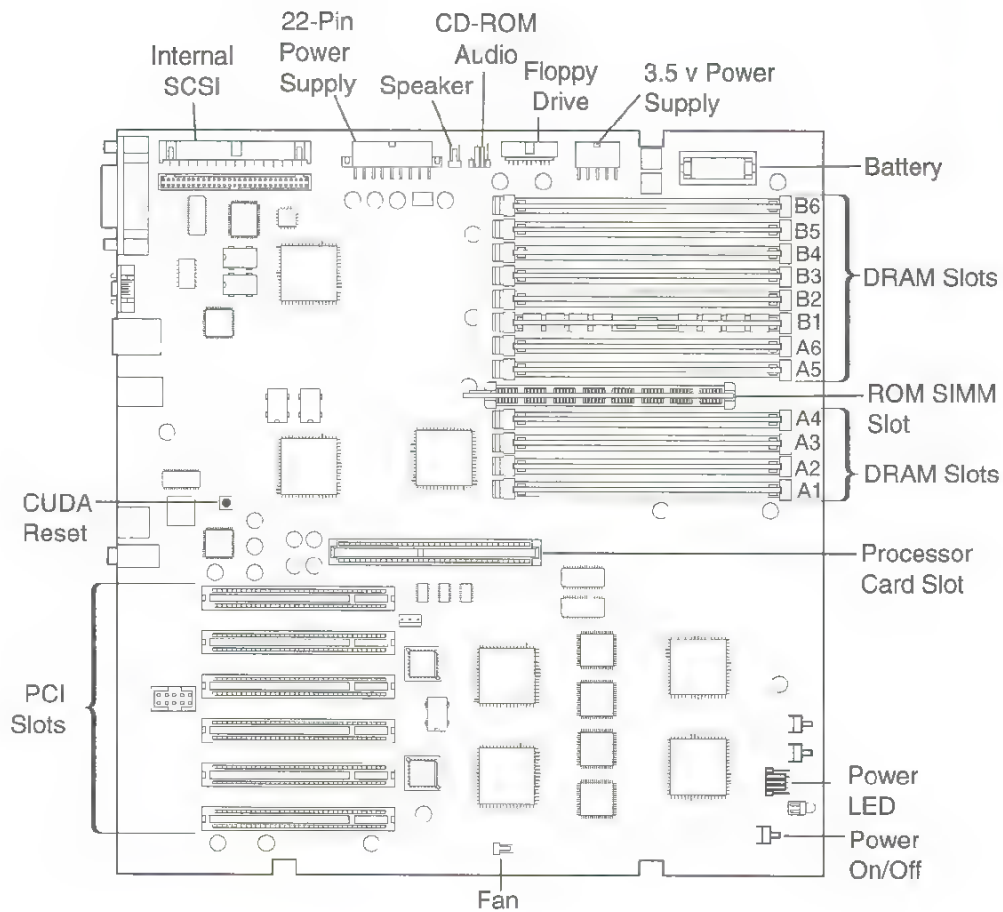


Figure 43. Power Macintosh 9500 Exploded View

## Logic Board and Processor Card



### Processor Card

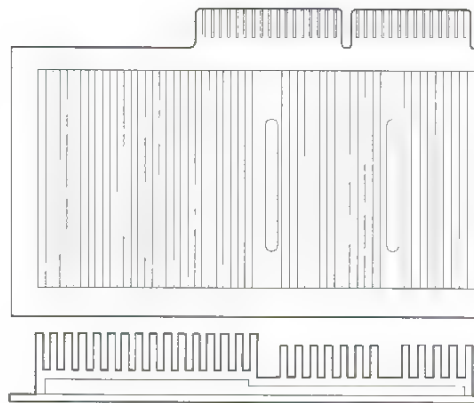
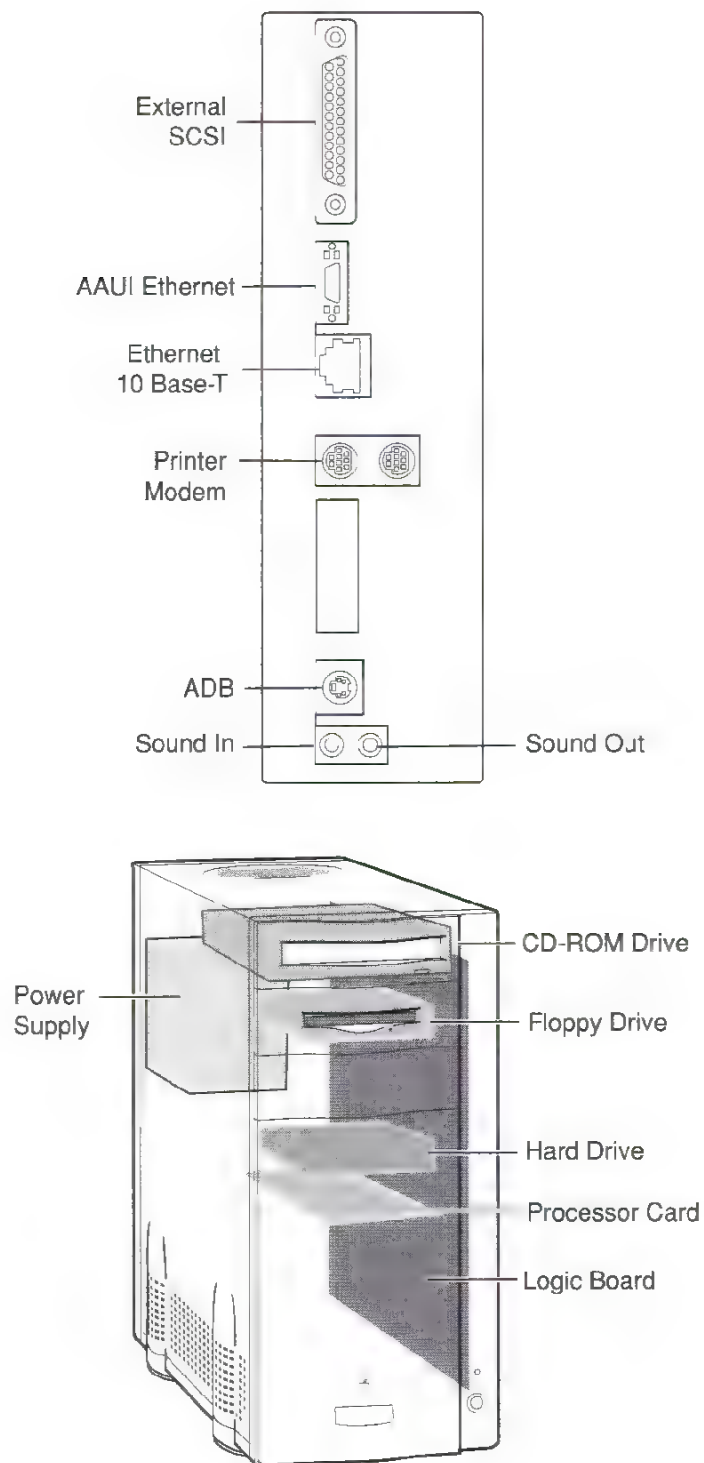


Figure 44. Power Macintosh 9500 Logic Board and Processor Card



## Back Panel and Locator View



**Figure 45. Power Macintosh 9500 Back Panel and Locator View**

## Parts List

Actuator, Power (Pkg. of 10) .....	922-1543
Battery, Lithium, 3.6V, without Leads .....	922-1262
Bezel, Blank, Version 2 .....	922-0620
Bezel, CD-ROM Drive, Trayloading (Pkg. of 5) .....	922-0811
Bezel, Floppy Drive, Manual Insert .....	922-0523
Board, Logic .....	661-0924
Brace, Chassis Support .....	922-0396
Cable, AC Power, External .....	590-0760
Cable, CD Audio (Pkg. of 5) .....	922-0724
Cable, Floppy Drive .....	922-0872
Cable, Hard Drive/CD-ROM Drive, SCSI .....	922-1524
Cable, LED .....	922-0841
Cable, Power Supply to Logic Board, 22 pin .....	922-0838
Card, 604 Processor, 120 MHz .....	661-0925
Card, 604 Processor, 132 MHz .....	661-1002
Card, Apple Accelerated Graphics .....	661-0926
Carrier, CD-ROM Drive .....	922-0850
Carrier, Floppy Drive, Manual Insert .....	922-0445
Carrier, Hard Drive/Tape Drive, 3.5" .....	922-0621
CD-ROM Drive, AppleCD 600i .....	661-0913
Chassis, Internal .....	922-1528
Cover, Battery Holder .....	520-0344
Cover, Blank, PCI Card (Pkg. of 10) .....	922-1628
DIMM, DRAM, 8 MB, 70 ns, 168 pin .....	661-0918
DIMM, DRAM, 16 MB, 70 ns, 168 pin .....	661-0919
Fan Assembly .....	922-1525
Floppy Drive, Apple SuperDrive, 1.4 MB, Manual Insert .....	661-0121
Guard, Logic Board .....	922-1530
Hard Drive, 1 GB, 3.5", SCSI .....	661-0228
Hard Drive, 2 GB, 3.5", SCSI .....	661-0180
Housing, Speaker .....	922-0394
Housing, Top .....	922-1529
Keyboard, AppleDesign .....	661-0310
Label, FCC, Power Macintosh 9500 (Pkg. of 10) .....	922-1532
Label, Product ID, Power Macintosh 9500/120 .....	922-1533
Label, Product ID, Power Macintosh 9500/132 .....	922-1591
Microphone, Apple PlainTalk .....	922-0867
Mouse II, Apple Desktop Bus, Version B .....	661-0104
Panel, Front, without Bezels .....	922-1542
Panel, Rear .....	922-1527
Power Supply, 225 W, 3.3 V .....	661-0923
Screw, M3.5x0.6x10mm (Pkg. of 10) .....	922-0119
Screw, M3x8mm, Pan Head, Philips (Pkg. of 10) .....	922-0401

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Screw, Net, Sems, M3x.5, Pan (Pkg. of 25).....	922-0895
Screw, Sems 6-32x.313 PN CRS.....	440-6105
Screw, Tap, M3.5x1.57x7mm, PT, Torx (Pkg. of 10).....	922-0117
Screw, Slotted, Thumb, 6-32 (Pkg. of 4).....	922-0395
Shield, CD-ROM Drive, Trayloading (Pkg. of 5).....	922-0812
Shield, Floppy Drive (Pkg. of 5).....	922-0813
Speaker.....	922-0353
Telecom Adapter, US/Canada/Hong Kong/Latin America.....	661-1703

**Table 8. Power Macintosh 9500 Specifications**

<b>Processor</b>	<p>9500/120: PowerPC 604 RISC microprocessor running at 120 MHz; Built-in FPU; Requires system software version 7.5.2 or later with System Enabler version 701</p> <p>9500/132: PowerPC 604 RISC microprocessor running at 132 MHz; Built-in FPU; Requires system software version 7.5.2 or later with System Enabler version 701</p>
<b>Memory</b>	<p>DRAM: 16 MB standard; expandable to 768 MB</p> <p>Uses 168-pin, 64-bit, 70 ns or faster DRAM DIMMs</p> <p>ROM: 4 MB ROM (may be installed in ROM SIMM slot, or soldered on the logic board)</p> <p>Cache: 512K Level 2 cache soldered on the logic board</p> <p>Clock/Calendar: CMOS custom circuitry with long-life battery</p>
<b>I/O Interfaces</b>	<p>SCSI: Dual-channel asynchronous SCSI interface; external channel supports up to seven SCSI devices; internal channel supports a hard disk array</p> <p>Serial: Two RS-232/RS-422 serial ports compatible with LocalTalk and GeoPort cables; mini DIN-8 connectors</p> <p>ADB: One Apple Desktop Bus port for a keyboard, mouse, etc.</p> <p>Ethernet: One AAUI and one 10Base-T Ethernet port (if cables are plugged into both ports, system defaults to 10Base-T)</p> <p>Expansion: Six PCI expansion slots, compatible with all PCI 2.0 specification-compliant cards (not NuBus compatible)</p> <p>Sound: 16-bit stereo sound input and output ports</p> <p>Video: 9500/120: DB-15 video port for display on Apple Accelerated Graphics card; 9500/132: No built-in video support; requires separate video card</p>
<b>I/O Devices</b>	<p>Keyboard: Standard, extended, or adjustable keyboard; keyboard draws 25-80 mA, depending on model type</p> <p>Mouse: ADB Mouse II; mouse draws up to 10 mA</p> <p>Microphone: Apple PlainTalk microphone standard</p>
<b>Video Support</b>	<p>9500/120: Ships with Apple Accelerated Graphics card, which includes 2 MB of VRAM (expandable to 4 MB via third-party memory module expansion card); supports all Apple and most third-party displays, including monochrome, color, VGA, and SVGA; supports up to 16.7 million colors on Apple color displays up to 17" and with 2 MB VRAM upgrade supports 16.7 million colors on Apple displays up to 21"</p> <p>9500/132: No built-in video support; requires third-party video card for display support</p>

**Table 8. Power Macintosh 9500 Specifications (Continued)**

<b>Disk Storage</b>	Hard Drive: 9500/120: One 1 GB internal hard drive; 9500/132: One 2 GB internal hard drive Floppy Drive: One Apple SuperDrive 1.4 MB floppy drive. CD-ROM Drive: One internal AppleCD 600i quadruple-speed CD-ROM drive
<b>Electrical</b>	Line Voltage: 100–240 VAC, RMS single phase, automatically configured Frequency: 50–60 Hz, single phase Maximum Power: DC Power: 225 W, not including monitor; AC Power: 340 W maximum continuous; 520 W peak input
<b>Physical</b>	Height: 16.9 in. (430 mm) Width: 7.75 in. (196 mm) Depth: 15.75 in. (400 mm) Weight: 28 lb. (12.7 kg); weight varies depending on devices installed.
<b>Environmental</b>	Operating Temperature: 50 to 104° F (10 to 40° C) Storage Temperature: -40 to 116° F (-40 to 47° C) Relative Humidity: 5% to 95% noncondensing Maximum Altitude: 10,000 ft. (3,048 m)



## Troubleshooting Procedures

### Resetting the Cuda Chip

Many system problems can be resolved by resetting the Cuda chip (see "Symptom/Cure Chart" for examples). Press the red Cuda reset button on the logic board to reset the Cuda chip (see Figure 44). If you continue to experience system problems, refer to Resetting the Logic Board below.

The Cuda is a microcontroller chip. Its function is to

- Turn system power on and off
- Manage system resets from various commands
- Maintain parameter RAM (PRAM)
- Manage the Apple Desktop Bus (ADB)
- Manage the real-time clock

### Resetting the Logic Board

Resetting the logic board can resolve many system problems (refer to "Symptom/Cure Chart" for examples). Whenever you have a unit that fails to power up, you should perform this procedure before replacing any modules.

#### Note

This procedure resets the computer's PRAM. Be sure to check the computer's time/date and other system parameter settings afterwards.

1. Unplug the computer.
2. Remove the logic board.
3. Using a small flat-blade screwdriver, pry open the latch at the end of the battery holder and lift off the battery holder cover.
4. Remove the battery from its holder.
5. Verify the power supply cable is disconnected from the logic board and then press the Power On button (see Figure 44).
6. Wait at least 10 minutes before replacing the battery. Make sure the battery is installed in the correct +/- direction.
7. Reassemble the computer and test the unit.

If this procedure resolves the problem, claim an adjustment on an SRO. If not, replace the defective component and DO NOT claim the adjustment procedure.

## Symptom/Cure Chart

This Symptom/Cure Chart will help you diagnose specific symptoms related to your product. Because the most likely solution is listed first, try the first-listed solution. Verify whether or not the product continues to exhibit the symptom. If the symptom persists, try the next solution. (Note: If you have replaced a module, reinstall the original module before you proceed to the next solution.)

For additional assistance, contact Apple Technical Support.

### Power Supply\*

#### Solutions

System doesn't power up

- 1 Reseat processor card, video card, and ROM SIMM (if present).
- 2 Reset Cuda chip. (Refer to Resetting the Cuda Chip in "Troubleshooting Procedures.")
- 3 Reset logic board. (Refer to Resetting the Logic Board in "Troubleshooting Procedures.")
- 4 Replace power supply.
- 5 Replace processor card.
- 6 Replace logic board. Retain customer's DIMMs.

### Error Chords\*

#### Solutions

One-part error chord sounds during startup sequence

- 1 Disconnect SCSI data cable from hard drive and reboot system. If startup sequence is normal, initialize hard drive. Test unit again with SCSI data cable connected. If error chord still sounds, replace hard drive.
- 2 Disconnect floppy drive cable from floppy drive and reboot system. If startup sequence is normal, replace floppy drive.
- 3 Reseat processor card.
- 4 Replace processor card.
- 5 Replace logic board. Retain customer's DIMMs.

Eight-part error chord (death chimes) sounds during startup sequence

- 1 Make sure DRAM is installed first in banks A6 and B6, followed by banks A5 and B5, etc. Do not install DRAM in banks A1 and B1 until all other banks are full.
- 2 Replace DRAM DIMMs one at a time to test DRAM. Replace any faulty DIMMs.
- 3 Replace logic board. Retain customer's DIMMs.

---

\* When you replace the logic board, be sure the LED cable is not interfering with the power cable.

---

**System\*****Solutions**

Does not power on, screen is black, fan is not running and LED is not lit

- 1 Check power cables.
- 2 Plug monitor directly into wall socket, and verify that monitor has power.
- 3 Reseat ROM SIMM (if present) and processor card. The logic board must have a processor card installed to operate.
- 4 Reset Cuda chip. (Refer to Resetting the Cuda Chip in "Troubleshooting Procedures.")
- 5 Reset logic board. (Refer to Resetting the Logic Board in "Troubleshooting Procedures.")
- 6 Replace power cord.
- 7 Replace power supply.
- 8 Replace processor card.
- 9 Replace logic board. Retain customer's DIMMs.

Clicking, chirping, or thumping

- 1 Remove all PCI cards and test the unit. If problem does not occur with cards removed, replace cards one at a time to determine which card is causing the problem. Replace problem card with known-good card.
- 2 Remove hard drive. If problem no longer occurs, replace hard drive with a known-good drive.
- 3 Replace power supply.
- 4 Replace processor card.
- 5 Replace logic board. Retain customer's DIMMs.
- 6 Replace floppy drive cable.
- 7 Replace floppy drive.

System shuts down intermittently

- 1 Make sure air vents are clear. Thermal protection circuitry may shut down system. After 30 to 40 minutes, system should be OK.
- 2 Make sure power cord is firmly plugged in.
- 3 Verify fan is plugged in and working. Replace if necessary.
- 4 Replace power cord.
- 5 Check battery.
- 6 Reset Cuda chip. (Refer to Resetting the Cuda Chip in "Troubleshooting Procedures.")
- 7 Reset logic board. (Refer to Resetting the Logic Board in "Troubleshooting Procedures.")
- 8 Replace power supply.
- 9 Replace processor card.
- 10 Replace logic board. Retain customer's DIMMs.

System intermittently crashes or hangs

- 1 Verify system software is version 7.5.2 or later.
- 2 Verify DIMMs are noncomposite.
- 3 Verify software is known-good. Do a clean install of the system software.
- 4 Verify software is Power Macintosh 9500 compatible (contact developer). Also, try booting with extensions off to determine if there are system init problems.
- 5 Clear parameter RAM. Hold down Command-Option-P-R during startup but before "Welcome to Macintosh" appears.
- 6 Remove all DRAM DIMMs and try replacing them one at a time to test. Replace any bad DIMMs.
- 7 Replace processor card.
- 8 Replace logic board. Retain DIMMs.

During startup, following message is displayed, "This startup disk will not work on this Macintosh model...."

- 1 Verify that startup disk is good.
- 2 Verify system software is version 7.5.2 or later.
- 3 Do a clean install of system software.

#### **Video\***

Screen is black, boot tone is present, drive operates, fan is running, and LED is lit

#### **Solutions**

- 1 Adjust brightness on monitor.
- 2 Clear parameter RAM. Hold down Command-Option-P-R during startup but before "Welcome to Macintosh" appears.
- 3 Verify video card is installed and reseal card.
- 4 Reset Cuda chip. (Refer to Resetting the Cuda Chip in "Troubleshooting Procedures.")
- 5 Reset logic board. (Refer to Resetting the Logic Board in "Troubleshooting Procedures.")
- 6 Replace video cable.
- 7 Remove all DRAM DIMMs and try replacing them one at a time to test. Replace any bad DIMMs.
- 8 Replace video card.
- 9 Test with known-good monitor. Replace monitor if necessary. Refer to appropriate monitor manual to troubleshoot defective monitor.
- 10 Replace processor card.
- 11 Replace logic board. Retain customer's DIMMs.

Screen is black, no boot tone and drive does not operate, but fan is running and LED is lit

- 1 Reset Cuda chip. (Refer to Resetting the Cuda Chip in "Troubleshooting Procedures.")
- 2 Reset logic board. (Refer to Resetting the Logic Board in "Troubleshooting Procedures.")
- 3 Remove all DRAM DIMMs and try replacing them one at a time to test. Replace any bad DIMMs.
- 4 Replace processor card.
- 5 Replace logic board. Retain customer's DIMMs.
- 6 Replace power supply.

Boot tone is present and screen lights up, but nothing is displayed on screen

- 1 Reset Cuda chip. (Refer to Resetting the Cuda Chip in "Troubleshooting Procedures.")
- 2 Reset logic board. (Refer to Resetting the Logic Board in "Troubleshooting Procedures.")
- 3 Replace video cable.
- 4 Replace video card.
- 5 Test with known-good monitor. Replace monitor if necessary. Refer to appropriate monitor manual to troubleshoot defective monitor.
- 6 Replace processor card.
- 7 Replace logic board. Retain customer's DIMMs.

### Floppy Drive\*

Internal floppy drive does not operate

- 1 Replace floppy disk with known-good disk.
- 2 Replace floppy drive cable.
- 3 Replace floppy drive.
- 4 Replace logic board. Retain customer's DIMMs.
- 5 Replace processor card.

During system startup, disk ejects; display shows icon with blinking "X"

- 1 Replace disk with known-good system disk.
- 2 Replace floppy drive cable.
- 3 Replace floppy drive.
- 4 Replace logic board. Retain customer's DIMMs.
- 5 Replace processor card.

Does not eject disk

- 1 Switch off computer. Hold mouse button down while you switch computer on.
- 2 Replace floppy drive cable.
- 3 Replace floppy drive.
- 4 Replace logic board. Retain customer's DIMMs.
- 5 Replace processor card.



Attempts to eject disk, but doesn't

- 1 Reseat floppy drive bezel and drive so bezel slot aligns correctly with drive.
- 2 Replace floppy drive.

Internal floppy drive runs continuously

- 1 Replace disk with known-good floppy disk.
- 2 Replace floppy drive cable.
- 3 Replace floppy drive.
- 4 Replace logic board. Retain customer's DIMMs.
- 5 Replace processor card.

MS-DOS drive does not recognize a disk formatted on a 1.4 MB drive

To read and write files with either MS-DOS or 1.4 MB drive, format all disks with MS-DOS drive first.

### Hard Drive\*

### Solutions

Single internal hard drive does not operate; drive doesn't spin

- 1 Replace hard drive power cable.
- 2 Replace hard drive. If problem is resolved, reinstall SCSI device driver and system software.
- 3 Replace power supply.

No internal SCSI drives operate

- 1 Verify there are no duplicate SCSI device addresses.
- 2 Disconnect external SCSI devices and check for proper termination. Only last device in SCSI chain should be terminated.
- 3 Replace SCSI data cable.
- 4 Replace power supply.
- 5 Replace logic board. Retain customer's DIMMs.
- 6 Replace processor card.

Drive does not appear on the desktop

- 1 Verify there are no duplicate SCSI device addresses.
- 2 Update the SCSI device driver using Drive Setup. Run Disk First Aid to verify the condition of the drive's directory structure.
- 3 Replace the SCSI hard drive cable.
- 4 If drive is not initialized, use Drive Setup to initialize.
- 5 Replace with known-good hard drive.
- 6 If the hard drive still doesn't work, switch back to the original hard drive and replace the logic board.

Works with internal or external SCSI devices but not with both

- 1 Verify there are no duplicate SCSI device addresses.
- 2 Replace terminator on external SCSI device.
- 3 Verify that SCSI device at end of internal SCSI data cable is only device terminated.
- 4 Refer to appropriate manual to troubleshoot defective external device.

## Peripherals\*

Cursor does not move

- 1 Check mouse connection.
- 2 Inspect inside of mouse for buildup of dirt or other contaminants. Clean mouse if necessary.
- 3 If mouse was connected to keyboard, connect mouse to computer ADB port instead. If mouse works, replace keyboard.
- 4 Replace ADB cable.
- 5 If mouse does not work in any ADB port on computer, replace mouse.
- 6 Replace logic board. Retain customer's DIMMs
- 7 Replace processor card.

Cursor moves, but clicking mouse button has no effect

- 1 Boot from floppy or bootable CD.
- 2 Replace mouse.
- 3 Replace logic board. Retain customer's DIMMs.

Double-click doesn't open application, disk, or server

- 1 Remove duplicate system folders.
- 2 Clear parameter RAM. Hold down Command-Option-P-R during startup but before "Welcome to Macintosh" appears.
- 3 If mouse was connected to keyboard, connect mouse to computer ADB port instead. If mouse works, replace keyboard. If mouse does not work in any ADB port on computer, replace mouse.
- 4 Replace logic board. Retain customer's DIMMs.

No response to any key on keyboard

- 1 Check keyboard connection to ADB port.
- 2 Replace keyboard cable.
- 3 Replace keyboard.
- 4 Replace logic board. Retain customer's DIMMs.

---

Known-good serial printer  
does not work

- 1 Verify you have correct version of system software.
- 2 Verify that Chooser is set correctly.
- 3 Reinstall correct printer drivers.
- 4 Do clean install of system software.
- 5 Replace printer interface cable.
- 6 Replace logic board. Retain customer's DIMMs.

Known-good network printer  
does not print

- 1 Check network connections.
- 2 Verify you have correct version of system software.
- 3 Verify that Chooser is set correctly.
- 4 Does printer show up in Chooser? If so, do clean install of system software and/or network and printer software.
- 5 Replace logic board. Retain customer's DIMMs.

#### **CD-ROM Drive\***

#### **Solutions**

CD-ROM drive does not work

- 1 Try using known-good compact disc.
- 2 Replace CD-ROM drive mechanism.

Macintosh does not display  
CD-ROM icon once CD is  
inserted in drive

- 1 Verify that CD-ROM software is installed.
- 2 Replace CD-ROM drive mechanism.
- 3 Replace SCSI data cable.

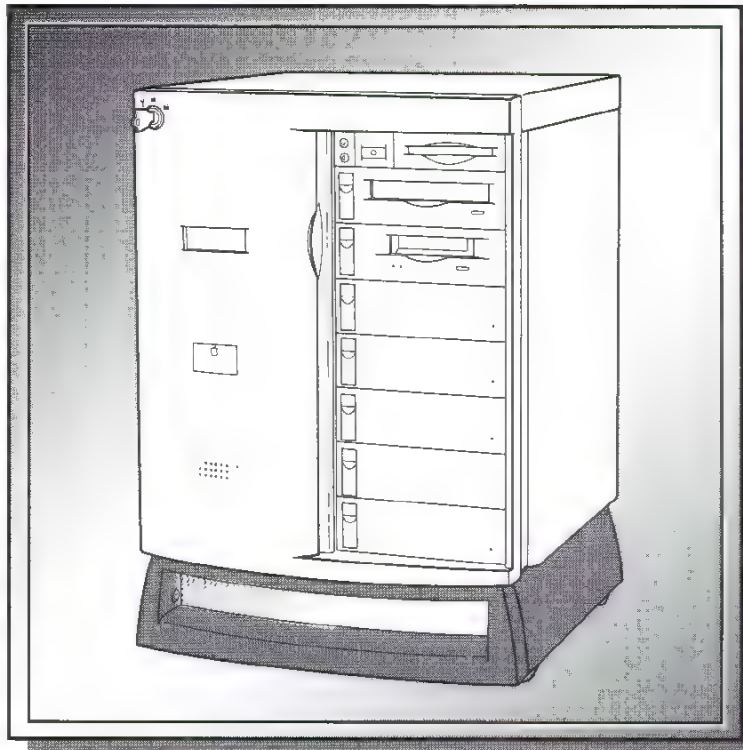
#### **Miscellaneous\***

#### **Solutions**

No sound from speaker

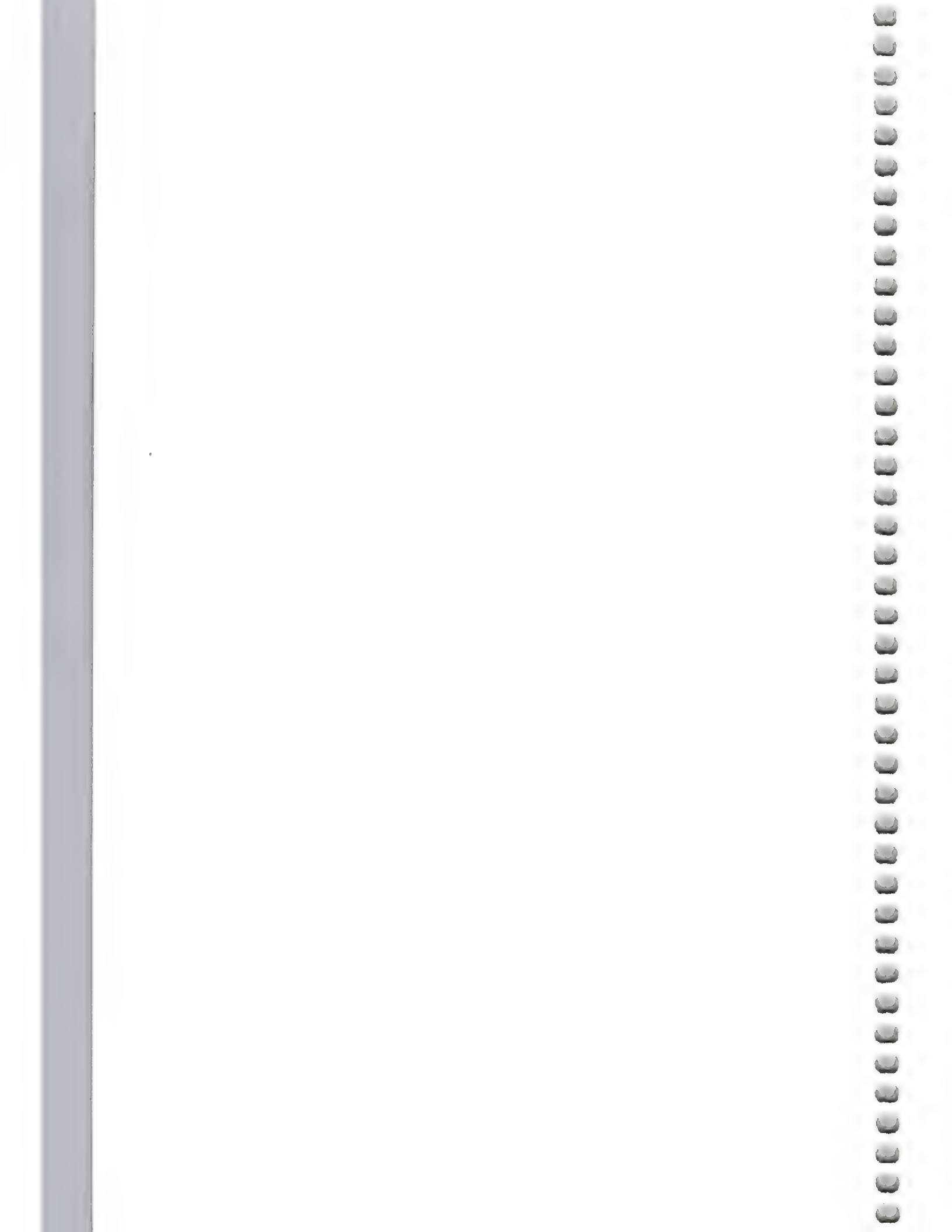
- 1 Verify that volume setting in Control Panel is 1 or above.
- 2 Clear parameter RAM. Hold down Command-Option-P-R during startup but before "Welcome to Macintosh" appears.
- 3 Verify speaker is plugged into logic board.
- 4 Replace speaker.
- 5 Replace logic board. Retain customer's DIMMs.

# Apple Network Server 500/700



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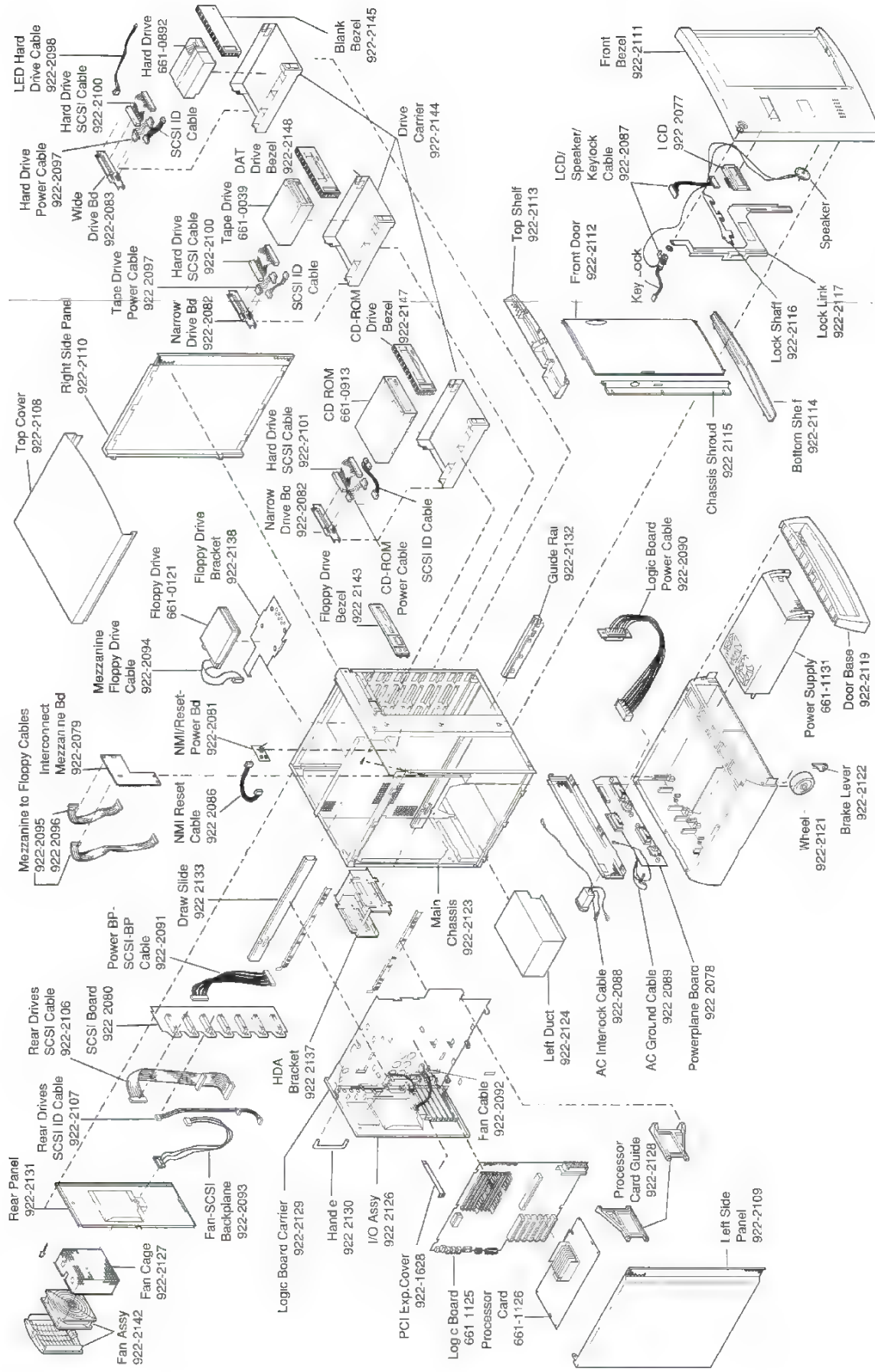
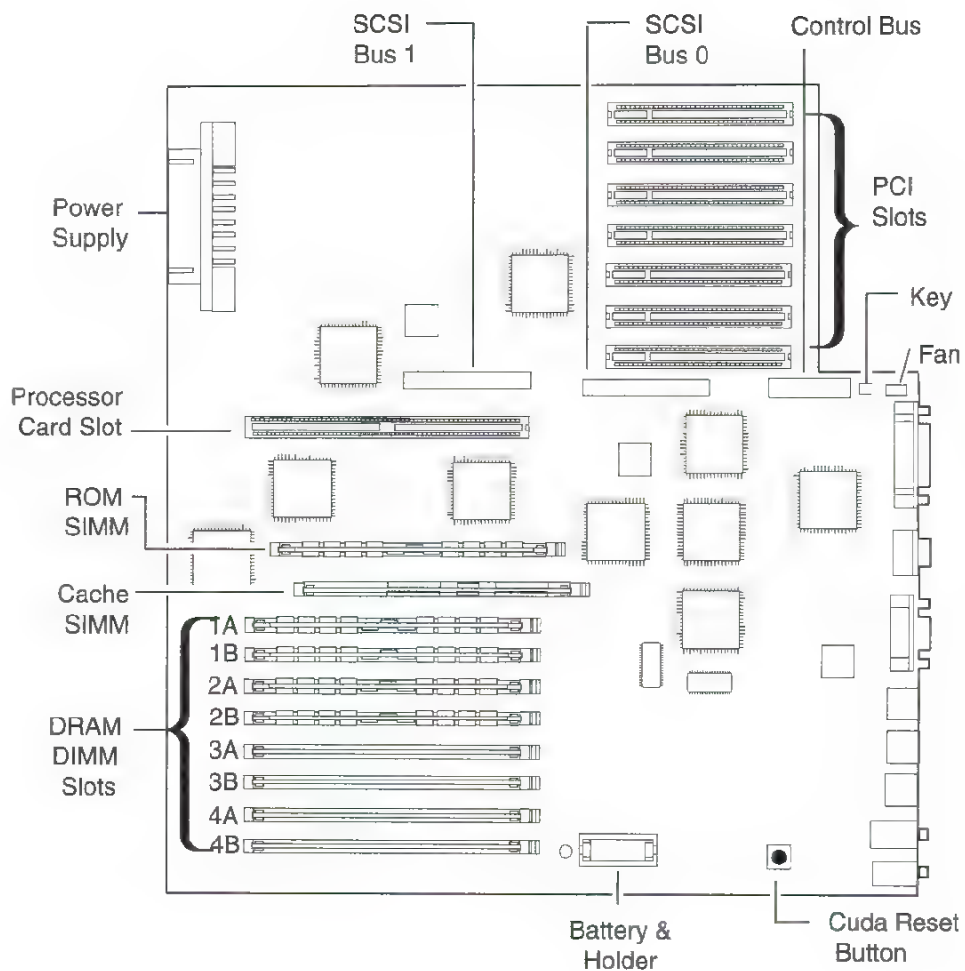


Figure 46. Apple Network Server Exploded View



## Logic Board and Processor Card



### Processor Board

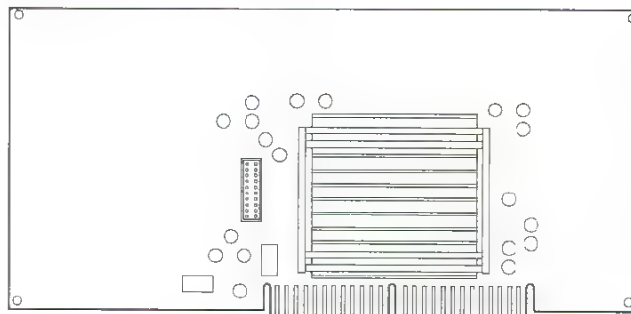
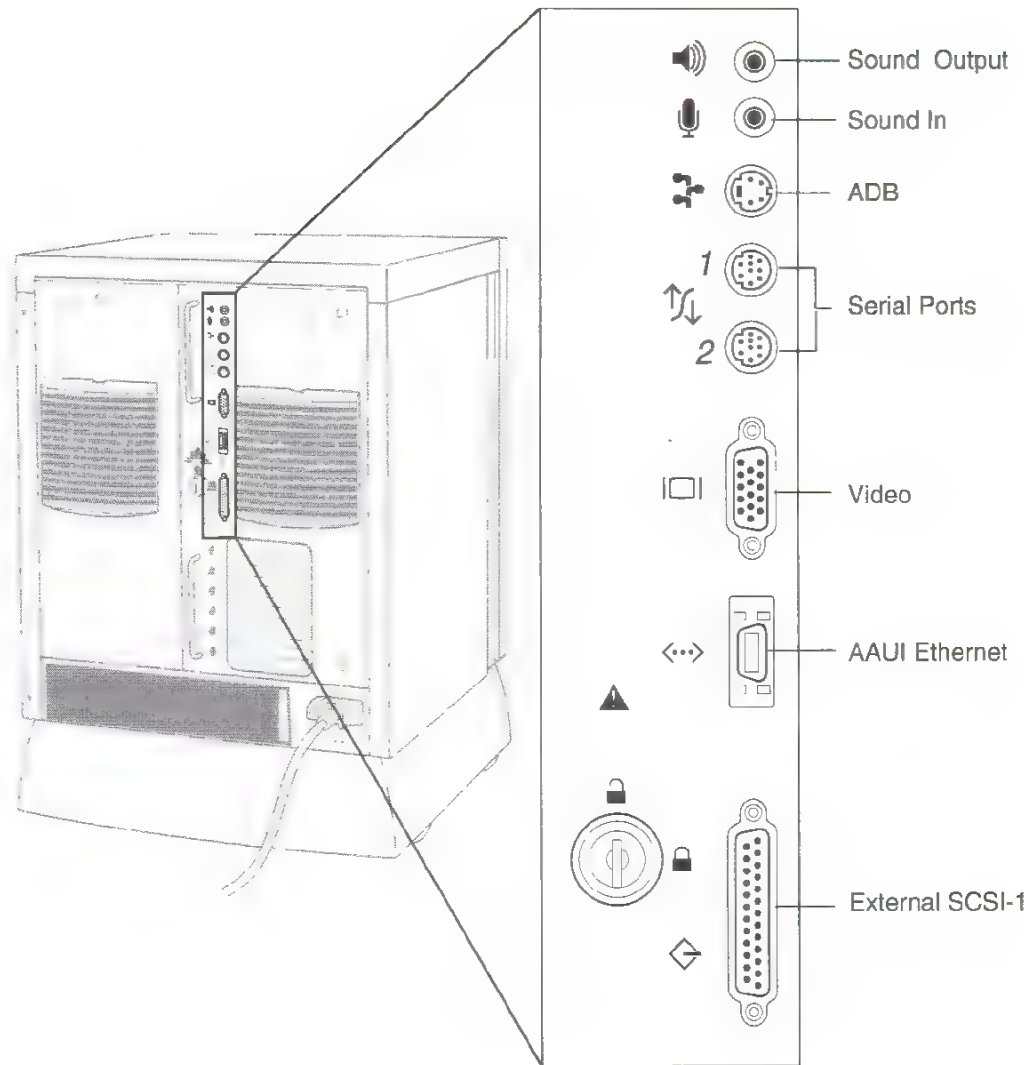


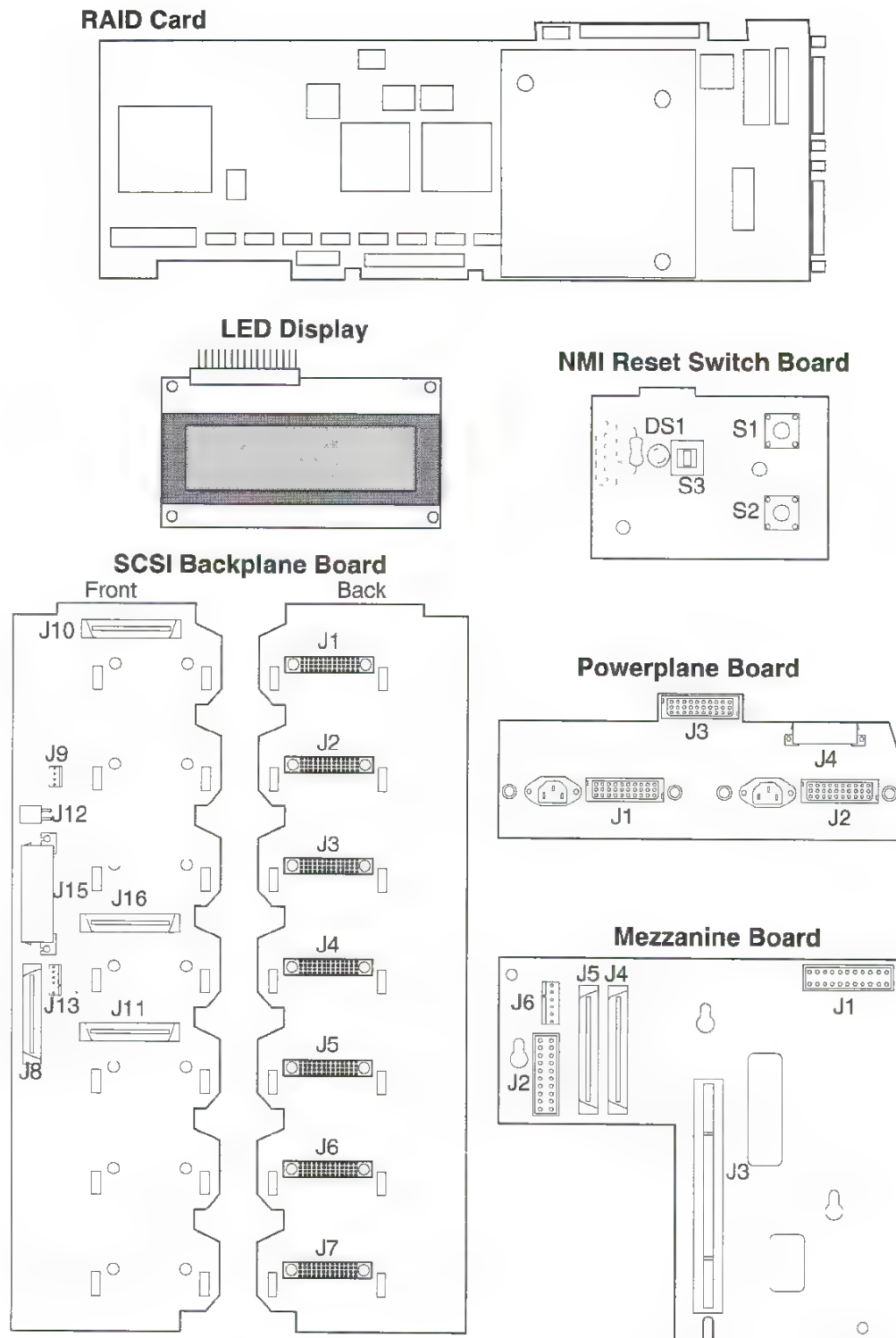
Figure 47. Apple Network Server Logic Board and Processor Card

## Back Panel



**Figure 48. Apple Network Server Back Panel**

## RAID Card, SCSI Backplane, and Other Boards

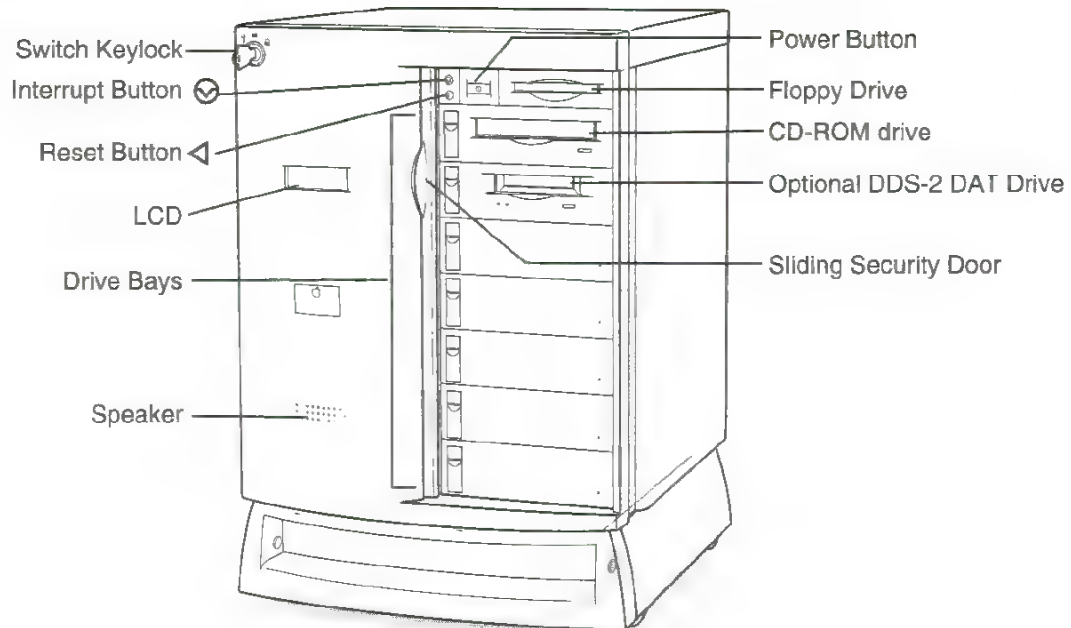


**Figure 49. Apple Network Server RAID Card, SCSI Backplane, and Other Boards**

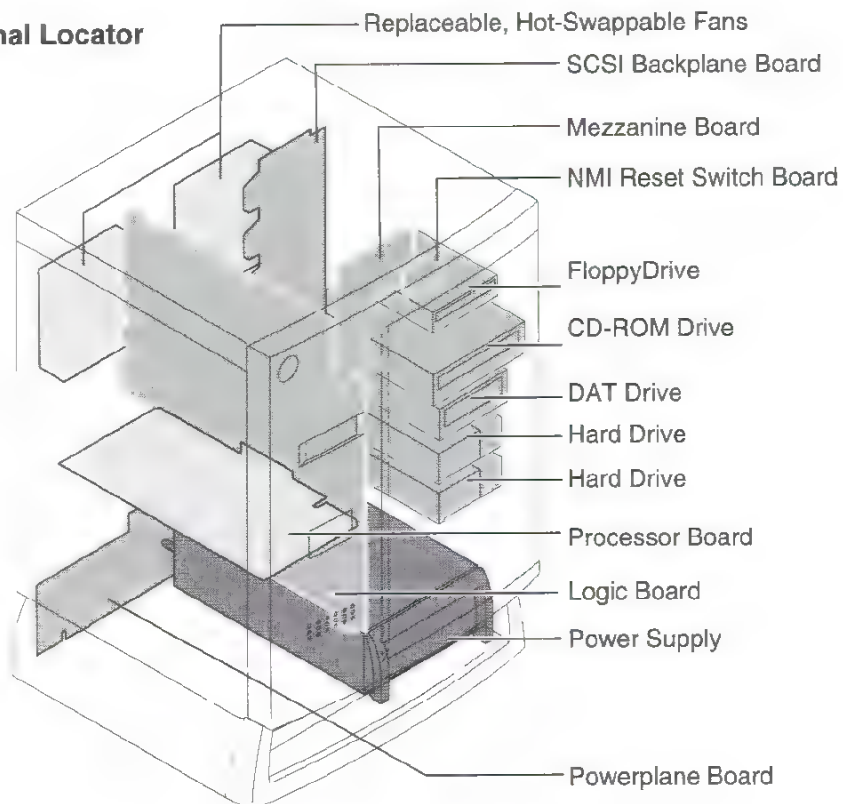


## Locator Views

### Front View Locator



### Internal Locator



**Figure 50. Apple Network Server Locator Views**

## Parts List

Axle, Wheel.....	922-2221
Base, with Wheels.....	922-2120
Battery, Lithium, 3.6 V, without Leads .....	922-1262
Bezel, Blank.....	922-2145
Bezel, CD-ROM Drive .....	922-2147
Bezel, DAT Drive .....	922-2148
Bezel, Floppy Drive .....	922-2143
Bezel, Front.....	922-2111
Board, Interconnect, Drive, Narrow.....	922-2082
Board, Interconnect, Drive, Wide.....	922-2083
Board, Interconnect, Mezzanine .....	922-2079
Board, Interconnect, NMI/Reset-Power .....	922-2081
Board, Interconnect, Powerplane .....	922-2078
Board, Interconnect, SCSI Backplane .....	922-2080
Board, Logic .....	661-1125
Bracket, Floppy Drive.....	922-2138
Bracket, Rear Hard Drives.....	922-2137
Cable, Mac/PC Adapter.....	922-0736
Cable, AC Interlock, Receptacle, and Ground.....	922-2088
Cable, Fan-to-Logic Board.....	922-2092
Cable, Fan-to-SCSI Backplane.....	922-2093
Cable, Hard Drive, LED .....	922-2098
Cable, LCD/Speaker/Keylock.....	922-2087
Cable, Mezzanine-to-Front Panel.....	922-2085
Cable, Mezzanine-to-Floppy Drive .....	922-2094
Cable, NMI Reset Switch .....	922-2086
Cable, Power Backplane-to-Logic Board.....	922-2090
Cable, Power Backplane-to-SCSI Backplane.....	922-2091
Cable, Power, SCSI .....	922-2097
Cable, RAID, 26 pin.....	922-2250
Cable, RAID, 68 pin.....	922-2251
Cable, RAID, 68 pin.....	922-2249
Cable, Rear Drives, Power .....	922-2105
Cable, Rear Drives, SCSI.....	922-2106
Cable, Rear Drives, SCSI ID.....	922-2107
Cable, Rear Keyswitch .....	922-2089
Cable, SCSI ID, Type 1 .....	922-2102
Cable, SCSI ID, Type 2 .....	922-2103
Cable, SCSI ID, Type 3 .....	922-2104
Cable, SCSI ID, Type 4 .....	922-2099
Cable, SCSI, 50 pin.....	922-2101
Cable, SCSI, 68 pin.....	922-2100
Cable, SCSI, Mezzanine-to-SCSI Backplane, 68 pin, 10" .....	922-2095

Cable, SCSI, Mezzanine-to-SCSI Backplane, 68 pin, 20" ...	922-2096
Cage, Fan.....	922-2127
Card Guide, Processor .....	922-2128
Card, Ethernet, 100BaseTX, PCI .....	661-0985
Card, Ethernet, 10Base2/10BaseT/AAUI, PCI .....	661-0986
Card, Processor, 604, 132 MHz .....	661-1144
Card, Processor, 604, 150 MHz.....	661-1126
Card, RAID, Network Server .....	661-1158
Carrier, Drive .....	922-2144
Carrier, Logic Board .....	922-2129
CD-ROM Drive, AppleCD 600i, Rev. B .....	661-1167
Chassis, Main.....	922-2123
Clip, Ground .....	922-2134
Cover, Battery Holder .....	520-0344
Cover, Blank, PCI Card (Pkg. of 10) .....	922-1628
Cover, Top .....	922-2108
DIMM, Cache, 1 MB, 11 ns, 160 pin .....	661-1127
DIMM, DRAM, 16 MB, 60 ns, 168 pin, Parity.....	661-1129
DIMM, DRAM, 32 MB, 60 ns, 168 pin, Parity.....	661-1130
DIMM, DRAM, 8 MB, 60 ns, 168 pin, Parity.....	661-1128
DIMM, Cache, 512 KB, 11 ns, 160 pin.....	661-0927
Display, LCD.....	922-2077
Door, Base....	922-2119
Door, Front .....	922-2112
Duct, Left.....	922-2124
Fan .....	922-2142
Floppy Drive, Apple SuperDrive, 1.4 MB, Manual Insert.....	661-0121
Gasket, Speaker .....	922-2213
Handle, Logic Module .....	922-2130
Hard Drive, 2 GB, Fast/Wide, 3.5", SCSI .....	661-0956
Hard Drive, 4 GB, Fast/Wide, 3.5", SCSI .....	661-0958
Insulator, LCD Display .....	922-2269
Keyboard, AppleDesign.....	661-0310
Label, FCC .....	922-2140
Lever, Brake .....	922-2122
Link, Lock .....	922-2117
Locks, Front & Rear, with Keys.....	922-2084
Mouse II, Apple Desktop Bus, Version B.....	661-0104
Nameplate, Product ID, Network Server 500/132 .....	922-2222
Nameplate, Product ID, Network Server 700/150 .....	922-2141
Panel, Rear.....	922-2131
Panel, Rear, I/O .....	922-2126
Panel, Side, Left.....	922-2109

Panel, Side, Right .....	922-2110
Plate, Rear, Lower .....	922-2125
Power Supply, 325 W.....	661-1145
Power Supply, 425 W.....	661-1131
Rack Mount .....	922-2248
Rail, Guide.....	922-2132
Rails, Mounting, Left & Right .....	076-0597
Screw, 3x6mm, Pan, with Washer (Pkg. of 25) .....	922-1239
Screw, M2.5x.45x16MM (Pkg. of 10) .....	922-2227
Screw, M3.5x.06x6MM (Pkg. of 10) .....	922-0120
Screw, Machine, M3.5x.45 (Pkg. of 10) .....	922-2225
Screw, Machine, Pan, M3.5x6MM (Pkg. 10) .....	922-2229
Screw, Machine, Pan, Phillips, M3.5x10MM (Pkg.10) .....	922-2230
Screw, Sems 6-32x.250 (Pkg. 10) .....	922-2224
Scre, Stud, Flush Head, M4x12MM (Pkg. 10) .....	922-2228
Screw, Thumb (Pkg. of 10) .....	922-2231
Screw, Torx, M5x12MM (Pkg.10) .....	922-2226
Shaft, Lock.....	922-2116
Shelf, Bottom .....	922-2114
Shelf, Top .....	922-2113
Shield, EMI, Power Cover.....	922-2136
Shroud, Chassis .....	922-2115
Slide, Drawer.....	922-2133
Spring, Ground, Logic Board.....	922-2135
Spring, Torsion (Pkg. of 10).....	922-2118
Standoff (Pkg. of 10).....	922 2139
Tape Drive, DAT, DDS-2, 120 M.....	661-0039
Washer, Nylon, Flat (Pkg. of 10) .....	922-2232
Wheel.....	922-2121



## Specifications

**Table 9. Apple Network Server 500/700**

<b>Processor</b>	<p>Network Server 500/132: PowerPC 604 RISC microprocessor running at 132 MHz; built-in FPU; 32 KB of on-chip cache; requires AIX version 4.1.4</p> <p>Network Server 700/150: PowerPC 604 RISC microprocessor running at 150 MHz; built-in FPU; 32 KB of on-chip cache; requires AIX version 4.1.4</p>
<b>Memory</b>	<p>DRAM: Uses 168-pin, 72-bit, 60 ns (parity) or 70 ns (non-parity) DRAM DIMMs; 32 MB standard expandable to 512 MB (Network Server 500/132); 48 MB standard expandable to 512 MB (Network Server 700/150)</p> <p>ROM: 4 MB ROM</p> <p>Clock/Calendar: CMOS custom circuitry with long-life lithium battery</p> <p>Cache: 512K of Level 2 cache (Network Server 500/132); 1 MB of Level 2 cache (Network Server 700/150)</p>
<b>Disk Storage</b>	<p>Hard Drive: One 2 GB Fast/Wide SCSI internal hard drive (Network Server 500/132); One 4 GB Fast/Wide SCSI internal hard drive (Network Server 700/150)</p> <p>Floppy Drive: One Apple SuperDrive 1.4 MB floppy drive</p> <p>CD-ROM Drive: One internal AppleCD 600i quadruple-speed CD-ROM drive</p> <p>DDS-2 DAT Drive: One 3.5-inch DDS-2 DAT drive</p>
<b>I/O Interfaces</b>	<p>SCSI: Two Fast/Wide SCSI-2 channels which support internal devices and one SCSI-1 channel which supports external devices; a total of 14 SCSI devices (seven internal and seven external) can be connected to the server without adding additional PCI cards (Network Server 500/132); a total of 16 SCSI devices (nine internal and seven external) can be connected to the server without adding additional PCI cards (Network Server 700/150)</p> <p>Serial: Two RS-232/RS-422 serial ports compatible with Local-Talk and GeoPort cables; mini DIN-8 connectors</p> <p>ADB: One Apple Desktop Bus port for a keyboard, mouse, or a three-button mouse</p> <p>Ethernet: Built-in Ethernet (AAUI port)</p> <p>Video: SuperVGA (SVGA) port requires an HDI-15 cable</p> <p>PCI: Six PCI expansion slots, compatible with all PCI 2.0 specifications-compliant cards (not NuBus-compatible)</p>
<b>I/O Devices</b>	<p>Keyboard: Supports all Apple ADB keyboards (AIX requires an extended keyboard for installation)</p> <p>Mouse: Supports all models of the Apple ADB</p>



**Table 9. Apple Network Server 500/700 (Continued)**

<b>Sound and Video</b>	16-bit stereo sound input and output ports Built-in 1024 x 768, 800 x 600, 640 x 480 video support for 14-inch, 15-inch, 17-inch, and 20-inch monitors
<b>Electrical</b>	Line Voltage: 100–240 VAC, RMS single phase (automatically configured) Frequency: 50–60 Hz, single phase Maximum Power: 708 W maximum (not including monitor) Power Supply: Single, 325W (Network Server 500/132); one or two 425 W, hot-swappable supplies (Network Server 700/150)
<b>Power Requirements</b>	Apple Desktop Bus: Maximum power draw for all ADB devices: 500 milliamperes (mA), Apple mouse draws up to 10 mA, keyboard draws 25–80 mA (varies with keyboard model used) Note: It is recommended that you connect no more than three ADB devices to the Network Server.
<b>Expansion Cards and Devices</b>	If you add a PCI expansion card, or an internal SCSI device to your server, make sure the component doesn't exceed its maximum power allowance from the different voltage sources. Note that no single PCI card should exceed the 25 watt limit of the PCI Revision 2.1 specification. For SCSI devices, the average (thermal) power consumption per drive bay is 1.1 amps at +5 volts and 1.3 amps at +12 volts. Apple recommends that drives be configured for spin-up on command or delay.
<b>Physical</b>	Height: 24.5 inch Width: 16.5 inch Depth: 18 inch Weight: 84–92 lb. (exact weight varies depending on number and type of internal SCSI devices installed)
<b>Environmental</b>	Operating Temperature: 50° to 95° F (10° to 35° C) Storage Temperature: -40° to 116.6° F (-40° to 47° C) Relative Humidity: 20% to 80% noncondensing Maximum Altitude: 10,000 ft. (3,048 meters)

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## Overview of New Technologies

This section discusses new technologies introduced with the Network Server 500/132 and Network Server 700/150.

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### AIX

The Network Server 500/132 and Network Server 700/150 are designed to run IBM AIX version 4.1.4. The Network Servers are shipped with the following software:

- AIX version 4.1.4 operating system.
- AppleTalk and AppleTalk administration utilities. AppleTalk allows remotely connected Macintosh computers to access the AIX server without using TCP/IP or other networking protocols.
- Two symbiotic applications, Discus and CommandShell, created by Apple Computer, Inc., and engineered for use with AIX on the Network Server 500/132 and Network Server 700/150. CommandShell is a terminal emulator that runs multiple windows on a system, while Discus is a disk-management system that allows users to manage all aspects of disk storage. Discus provides a graphical user interface and offers various views of disk-storage structure, as well as management commands.

#### Note

Applications that use a Macintosh interface for handling UNIX tasks are called “symbiotic applications.”

---

### Memory Configurations

The Network Server 500/132 and Network Server 700/150 provide parity memory protection by using DRAM Dual Inline Memory Modules (DIMMs) with parity instead of DRAM Single Inline Memory Modules (SIMMs).

The server logic board has eight DRAM DIMM slots (each with a 64-bit wide data bus) that allow a maximum of 512 MB of main memory.

Although single DIMMs may be added, to take advantage of memory interleaving, the DIMMs should be installed in matched pairs (for example, two 16 MB DIMMs).

Memory interleaving allows the computer to read or write to its memory while other memory reads or writes are occurring, thus providing maximum performance.

#### Important

The parity DIMMs should be 72-bit-wide 168-pin fast-paged mode, 60-nano-second (ns) RAM access time or faster. DRAM must support byte writes. SIMMs and some DIMMs from older Macintosh computers will not work in the Network Server. The parity DIMMs should be installed in matched pairs

(for example, two 16 MB DIMMs, one in slot 1A, the other in slot 1B). Nonparity DRAM with 70-nanosecond DRAM access time or faster will work, however if there is any nonparity DRAM installed, all server parity checking is disabled.

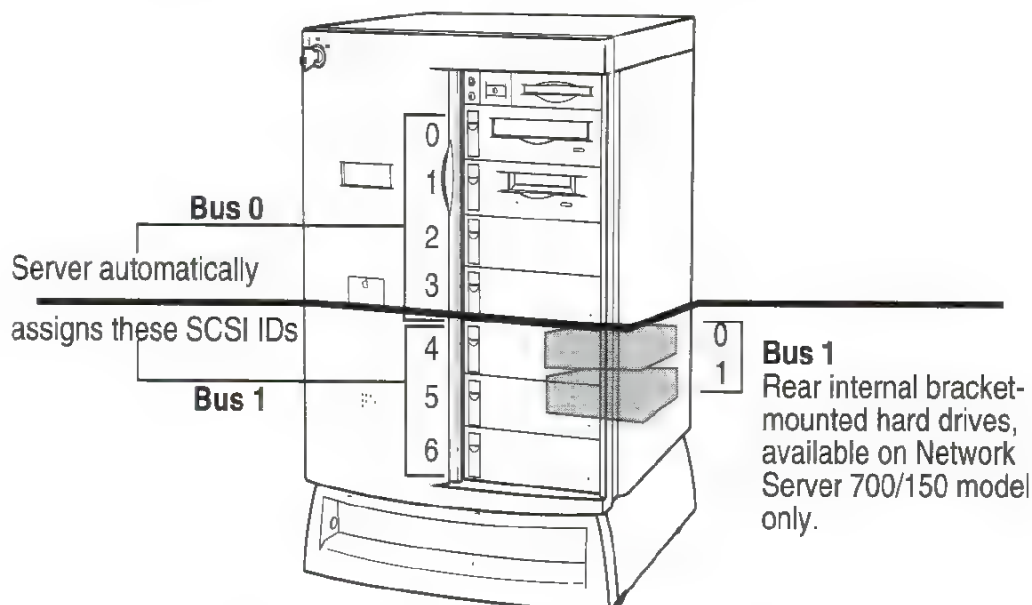
## SCSI IDs and Drive Termination

The Network Server 500/132 and Network Server 700/150 have three separate SCSI buses: two internal and one external. The server automatically assigns SCSI ID numbers to internal drives as shown in Figure 51.

The buses accommodate four, five, and seven SCSI devices, respectively. Thus, a total of 16 SCSI devices can be connected to the server without adding PCI cards.

The internal buses handle the built-in startup hard drive, CD-ROM drive, digital audio tape (DAT) drive, and up to four additional SCSI drives on the Network Server 500/132 and six on the Network Server 700. The external bus accommodates up to seven external SCSI devices in a chain (such as hard drives, CD-ROM drives, scanners, printers, and tape-backup drives). The Fast/Wide SCSI-2 channels support only internal drives used in the Network Server 500/132 and Network Server 700/150.

To make installing SCSI devices as straightforward as possible, and to reduce the potential for SCSI bus problems, the internal SCSI cable has built-in termination. Before installing a SCSI device, make sure that SCSI termination is disabled on the device. To disable the SCSI termination, refer to the installation manual of that device.



**Figure 51. Internal SCSI Bus IDs**

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## **Fast/Wide SCSI**

Designed to be I/O intensive, the Network Server 500/132 and Network Server 700/150 achieve enhanced data throughput by providing two Fast/Wide SCSI-2 channels that support internal devices. The internal SCSI buses on the Network Servers support transfer rates up to 40 MB/sec. The Fast/Wide SCSI-2 channels support only internal drives used in the Network Server 500/132 and Network Server 700/150.

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## **Network Server PCI RAID Card**

The Network Server 500/132 and Network Server 700/150 offer six PCI expansion slots each, but due to a limitation in the PCI RAID implementation only four Network Server PCI RAID cards can be installed in a single Network Server 500/132 or Network Server 700/150.

The PCI RAID card is designed to be connected to the server's two internal SCSI-2 buses. In that case, the two SCSI-2 controller chips on the logic board are disabled and all internal SCSI devices (for example, hard drives, CD-ROM, DAT tapes, and so on) are controlled by the controller on the PCI RAID card.

Any other RAID cards in the system will provide external Fast/Wide SCSI-2 connectors for connection of external SCSI disk arrays.

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## **Hot-Swappable Drives**

The Network Server 500 and Network Server 700 contain a flexible SCSI backplane that allows the physical hot-swapping and hot-removal of SCSI wide and narrow devices. This ability to gracefully handle the logical addition and removal of drives is operating-system dependent. The optional Network Server PCI RAID Card allows the AIX operating system to be buffered from the logical consequences of drive addition and removal when setup in a RAID configuration. Hence, hot plug and removal is only recommended for RAID configurations.

### **Note**

An optional PCI RAID card must be installed to ensure that data will not be lost when drives are hot-swapped.



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## Hot-Swappable, Redundant Power Supply

The Network Server 700/150 has two bays for two power supplies. Although the server ships with only one power supply installed in the left bay, when a second power supply is installed in the other bay (right), the server power supply becomes hot-swappable. When one of the installed power supplies fails, its LED will turn off. The failed power supply can then be replaced without shutting down the server. (A message will display on the LCD indicating that it is safe to shutdown the server.)

### Note

Hot-swappable, redundant power supplies are not available for the Network Server 500/132.

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## LCD Display and Startup Diagnostics

On startup, the server executes the power-on self test, and then displays the ROM version and copyright information on the LCD. It then starts a series of tests, during which the ROM version and the parity DRAM size remain on the display.

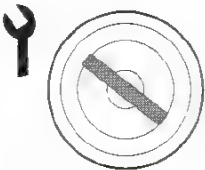
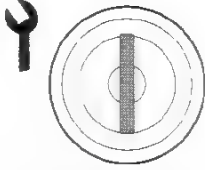
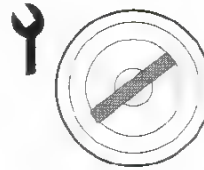
During the test phase of the startup process, the server display startup progress messages on the LCD display. If the server stops (freezes or hangs) with one of the progress messages displayed, the displayed information may be used to identify the module(s) in use. The module(s) might have failed, be incorrectly installed, or be incompatible.

After all the tests are complete, the LCD will display a configuration message. If the server is unable to load the operating system from a CD or hard drive, a problem may have been found during startup. The problem messages are displayed on the LCD display. The module (s) identified in the problem message might have failed, be incorrectly installed, or be incompatible.



## Keylock Positions

Figure 52 shows the three different keylock positions used in the Network Server 500/132 and Network Server 700/150, along with information listing the key mode (service, unlocked, or locked) and the access that each keylock position provides.

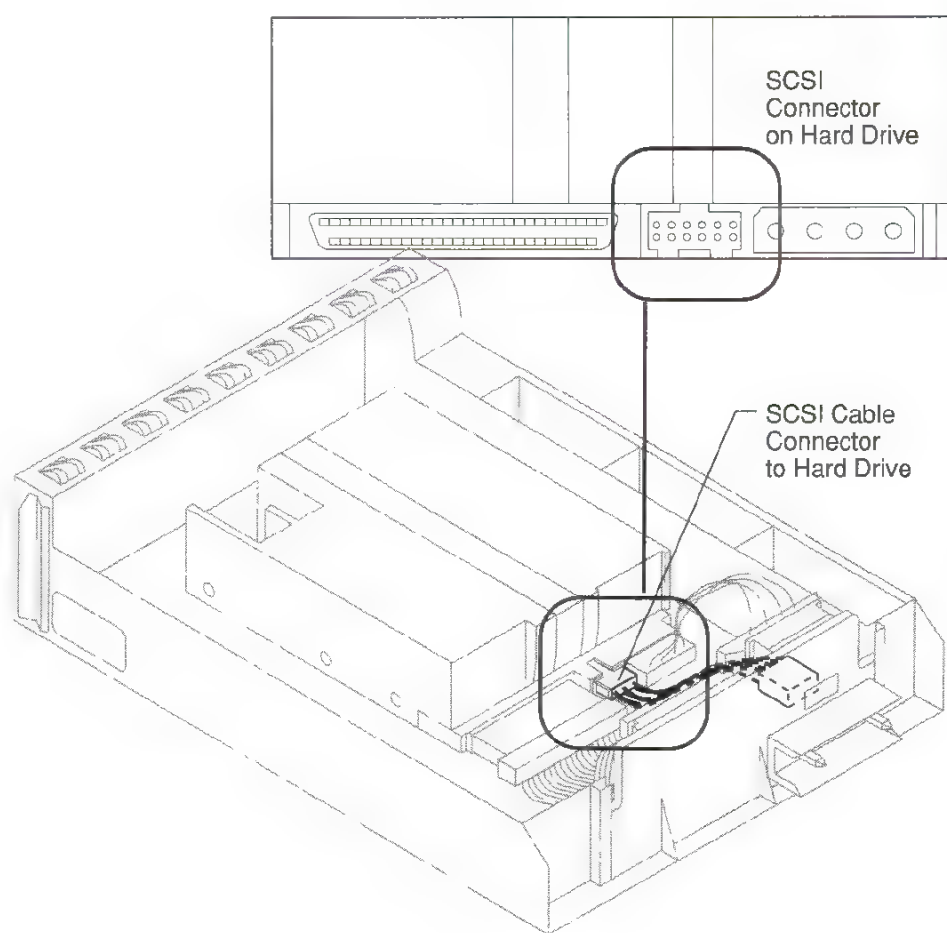
Left Position Service	Upright Position Unlocked	Right Position Locked
		
Access Available:		
<ul style="list-style-type: none"><li>• Front Door</li><li>• Base Door</li><li>• Power Supply</li><li>• Top Shelf</li><li>• Bottom Shelf</li></ul>	<ul style="list-style-type: none"><li>• Front Door</li><li>• Base Door</li><li>• Rear Drawer</li><li>• Power Supply</li><li>• Front Bezel Assembly</li><li>• Top Shelf</li><li>• Bottom Shelf</li></ul>	<ul style="list-style-type: none"><li>• Drive Trays- If the front door is positioned properly</li></ul>

**Figure 52. Keylock Position Matrix**

## Configuring the SCSI ID Cable

When you install a hard disk in a drive tray, the way you connect the SCSI ID cable to the drive depends on which type of drive you're installing. This section describes how to connect the SCSI ID cable for the 2 gigabyte (GB) and 4 GB IBM and Seagate hard drives, which are provided by Apple for the Network Server 500/132 and the Apple Network Server 700/150. If you install a Quantum drive or other drive with an active high LED signal, you need to rewire the SCSI cable as described below.

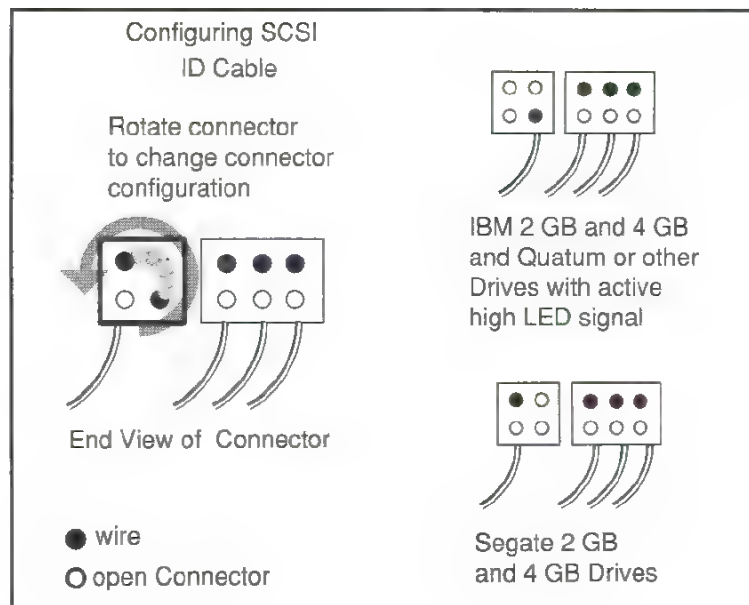
Figure 53 shows the location of the SCSI ID cable.



**Figure 53. SCSI ID Cable Locator**

## Connecting IBM and Seagate Drives (2 GB and 4 GB)

The IBM and Seagate Drives (2 GB and 4 GB) use a Type 1 cable. This cable connects to the drive board at the back of the drive tray and to the SCSI connector on the hard drive (as shown in Figure 53). The Type 1 SCSI cable has two parts: a six-pin connector and a four-pin connector. Check which kind of drive you have, then connect the cable to the drive according to Figure 54.

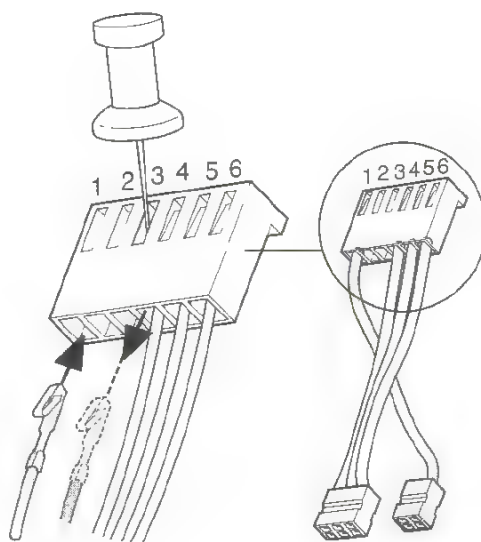


**Figure 54. Connecting IBM and Seagate Drives**

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## Rewiring Quantum Drives and Drives with Active High LEDs

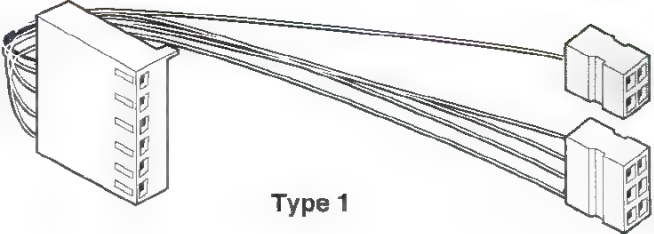
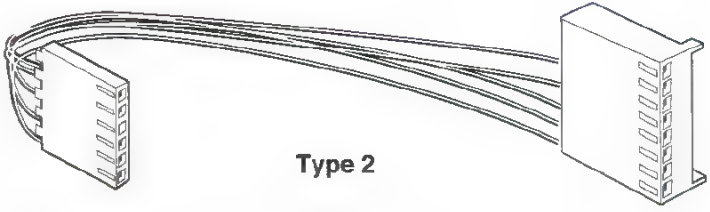
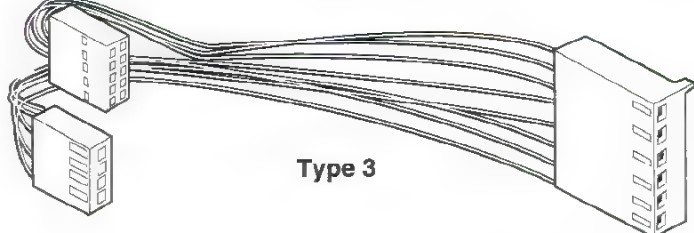
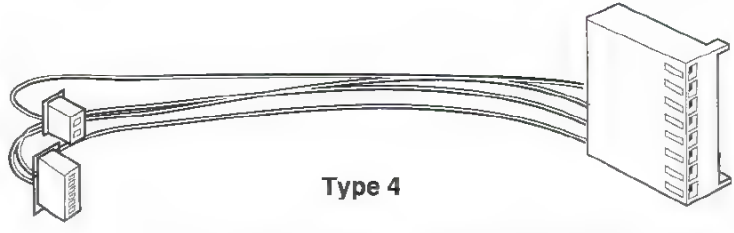
To install a Quantum drive or other drive with an active high LED, you need to remove the wire that connects to pin 3 on the drive tray connector, then insert the wire at pin 1 (see Figure 55). After you rewire the SCSI ID cable, connect the cable to the drive.



**Figure 55. Rewiring the SCSI Cable**

## SCSI ID Cable Connector Matrix

Figure 56, the SCSI ID Cable Matrix, shows the different kinds of SCSI ID connectors used in the Network Server 500/700. You must use the correct “Type” cable with a particular drive.

SCSI Drive Cables Connectors	Drives
 Type 1	2 GB Hard Drive and 4 GB Hard Drive
 Type 2	DAT Drive
 Type 3	CD-ROM Drive
 Type 4	1.2 GB Hard Drive

**Figure 56. SCSI ID Cable Matrix**



## Compatibility Issues

The following are compatibility issues associated with upgrading memory or installing PCI expansion cards for video, graphics applications, and networking and communications:

- The Network Server uses 72-bit-wide, 168 pin parity DRAM Dual Inline Memory Modules (DIMMs), which should be installed in matched pairs (for example, two 8 MB DIMMs). Your server's DIMMs are fast-paged mode, parity DRAM, with an access time of 60-nanoseconds or faster. Nonparity DIMMs with 70-nanosecond or faster access time DRAM will work; however, if there is any nonparity DRAM installed, all server parity checking is disabled.
- Some DIMMs and all Single Inline Memory Modules (SIMMs) from older Macintosh computers are not compatible. For more detailed information, see "Appendix B: DRAM Configurations" of *Setting up the Network Server*.
- The Network Server uses cards designed according to the Peripheral Component Interconnect (PCI) standard. Your server cannot accommodate NuBus cards, which were designed for older Macintosh computers.
- The combined power consumption of PCI expansion cards must not exceed the limits specified for the Network Server 500/132 and Network Server 700/150.
- The Network Servers support only multisynchronous displays.

---

## Setup and Operation

For more information on installing, using, and administering the Network Server, refer to the manuals that came with the Network Server. These manuals are:

- *Setting Up the Network Server*
- *Using AIX, appleTalk Services, and Mac OS Utilities on the Apple Network Server*
- *Network Server PCI RAID Disk Array Card Set Up and Administration*

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### Turning the Server On

To turn on the server you must perform the following steps:

- Turn on the monitor.
- Turn on all the external devices.
- Turn the key in the rear drawer lock to locked (horizontal) position.
- Turn the front lock key to the left (service) position.
- Turn the server on by pressing and holding the Power On button (next to the floppy drive).

The server will run the power-on self test and then clear the LCD display and display the ROM version and power supply status. During the startup process, messages will appear on the third line of the LCD display. Under normal circumstances, these messages will clear quickly, but if there is a startup problem, one of the messages may be displayed continuously.

---

### Shutting Down the Server

#### Note

You must have root privileges to shut down the server.

To shut down the server always use the Shutdown command because it is the safest and most thorough way to halt the server. Log in to the server as root and enter the Shutdown command with the appropriate option.

You can notify the users that the system is about to stop operations, terminate all existing processes, and unmount all filesystems by using the appropriate options provided in the Shutdown command. By default, the system waits one minute before stopping the user processes and the INIT process.

---

## Restarting the Server

### Note

You must have root privileges to restart the server.

If no other users are logged into the system, you can use the Reboot command to recopy the operating system from disk to memory (in case of newly installed software), to reset peripheral devices, or to perform routine maintenance tasks.

Use the Shutdown command instead of the Reboot command when the system is running and other users are logged in.

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## The Network Server Diagnostic Utility

The Network Server Diagnostic Utility allows you to verify basic capabilities of the Network Server 500 and Network Server 700. The Network Server Diagnostic Utility is designed for use with Network Server products ONLY. This utility will not run on any other server product previously released by Apple Computer, Inc.

The utility is included in the box with Network Servers and is also available to authorized service providers. The utility enables service providers and customers to easily determine functionality of the basic Network Server hardware components. Use this utility when you are unable to load and run the server operating system. You can also use this utility when you have completed installing or configuring new or replacement modules and you wish to verify that you have correctly configured your server system.

Features addressed on the Network Server Diagnostic Utility are:

- Hardware configuration
- Hardware component testing (memory, F/W SCSI controllers, PCI bridges, VGA and memory, NVRAM and LCD)
- Description of Network Server power-on self-test failures.

To ensure that you can stay up to date with future versions of the Network Server Diagnostic Utility software and documentation, look for updates by visiting the World Wide Web site at <http://www.solutions.apple.com>. When you arrive at the WWW site, be sure to click on the Network Server button and follow the instructions or click on additional buttons provided to obtain the up-to-date documentation and software.

### Resetting the Cuda Chip

Many system problems can be resolved by resetting the Cuda chip (see "Symptom/Cure Chart" for examples). Press the red Cuda reset button on the logic board to reset the Cuda chip (see Figure 46). If you continue to experience system problems, refer to Resetting the Logic Board below.

The Cuda is a microcontroller chip. Its function is to

- Turn system power on and off
- Manage system resets from various commands
- Maintain parameter RAM (PRAM)
- Manage the Apple Desktop Bus (ADB)
- Manage the real-time clock

### Resetting the Logic Board

Resetting the logic board can resolve many system problems (refer to "Symptom/Cure Chart" for examples). Whenever you have a unit that fails to power up, you should perform this procedure before replacing any modules.

#### Note

This procedure resets the computer's PRAM. Be sure to check the computer's time/date and other system parameter settings afterwards.

1. Unplug the computer.
2. Remove the logic board.
3. Using a small flat-blade screwdriver, pry open the latch at the end of the battery holder and lift off the battery holder cover.
4. Remove the battery from its holder.
5. Verify the power supply cable is disconnected from the logic board and then press the Power On button (see Figure 46).
6. Wait at least 10 minutes before replacing the battery. Make sure the battery is installed in the correct +/- direction.
7. Reassemble the computer and test the unit.

If this procedure resolves the problem, claim an adjustment on an SRO. If not, replace the defective component and DO NOT claim the adjustment procedure.



---

## Troubleshooting SCSI Devices

When troubleshooting SCSI devices, use this procedure to display information regarding which SCSI devices are currently recognized by the server. You can use the Network Server Diagnostic Utility or Open Firmware to determine which SCSI devices are installed.

1. Turn the front key to the upright (unlocked) position.
2. Turn on the server. If the server is already powered on, press the reset button. If AIX is running, shut down the system by executing the `shutdown-r` command.
3. While the system is resetting (or starting up), hold down the Command-Option-O-F keys until the `0>` prompt appears.
4. To use Network Server Diagnostic Utility insert the utility disk into the floppy drive and enter the command `boot fd: NWSDIAG`. Follow the instructions provided with the utility for verifying what SCSI devices are installed.
5. To use Open Firmware, enter the login command at the `0>` prompt and then enter the password at the O-F Password prompt. Enter the appropriate `probe-scsi` command. For example,
  - `probe-scsi0` to display the devices on the built-in external SCSI bus
  - `probe-scsi1` to display devices on the first internal SCSI bus
  - `probe-scsi2` to display devices on the second internal SCSI bus
6. The System displays the SCSI ID, logical unit, device type, manufacturer, model, and firmware version of SCSI devices it recognizes on the SCSI bus.
7. If you do not see the SCSI ID of the problem device, check the device for proper SCSI termination, SCSI ID, and cable connection. (Refer to "Setting Up Your Server and Connecting External Devices" in *Setting Up the Network Server* for more information.)

## Symptom/Cure Chart

This Symptom/Cure Chart will help you diagnose specific symptoms related to your product. Because the most likely solution is listed first, try the first-listed solution. Verify whether or not the product continues to exhibit the symptom. If the symptom persists, try the next solution. (Note: If you have replaced a module, reinstall the original module before you proceed to the next solution.)

The Network Server may exhibit certain symptoms that do not fall under the general troubleshooting information provided in this section. Under such circumstances, use your judgment and experience to diagnose the problem. Use the general troubleshooting information as a guideline to locate and define the cure(s) required.

For additional assistance, contact Apple Technical Support.

### Power

System does not power up, screen is blank, fan is not running, power LED is not lit

### Solutions

- 1 If the server is plugged into a power strip, verify that the power strip is turned on.
- 2 Check that power cable is firmly connected to server and to power source.
- 3 Plug monitor directly into wall socket and verify that monitor has power.
- 4 Verify that key in rear drawer is in horizontal (locked) position.
- 5 Verify that power supply is installed and properly seated.
- 6 Verify that power LED is on.
- 7 Verify that rear drawer is properly installed.
- 8 Reseat processor card.
- 9 Reseat cache DIMM.
- 10 Verify that all DRAM DIMMs are properly installed. Remove all DRAM DIMMs and replace them one at a time to test. Replace any bad DIMMs.
- 11 Reset Cuda chip. (Refer to Resetting the Cuda Chip in "Troubleshooting Procedures.")
- 12 Reset logic board. (Refer to Resetting the Logic Board in "Troubleshooting Procedures.")
- 13 Replace power cord.
- 14 Replace power supply.
- 15 Replace powerplane interconnect board.
- 16 Replace logic board. Retain customer's DIMMs.
- 17 Replace processor card.

---

## Startup

Cannot boot system from hard drive

## Solutions

- 1 Verify system software is installed on hard drive. If not, refer to *Using AIX, AppleTalk Services, and Mac OS Utilities on the Network Server* manual for information about installing and using the operating system.
- 2 Verify that server successfully booted from this hard drive before. If not, refer to *Using AIX, AppleTalk Services, and Mac OS Utilities on the Network Server* manual for information about installing and using the operating system.
- 3 Using Open Firmware, verify system startup path is configured for the correct hard drive.
- 4 If a problem message displays on the LCD during the startup process, refer to "LCD Panel and Diagnostics" in Troubleshooting Basics chapter on the *Service Source CD* to determine the problem component.
- 5 If a three-digit error code displays on the LCD, refer to "Chapter 10: Troubleshooting" of *Using AIX, AppleTalk Services, and Mac OS Utilities on the Network Server* for information on error codes and recommended actions.
- 6 Run Network Server Diagnostic Utility and follow the instructions provided with the utility to verify core system operations.
- 7 If boot drive is in the rear internal bracket (Network Server 700/150 only), verify that the hard drives are properly connected and terminated. If the server does not boot,
  - a. Replace the rear drives SCSI cable.
  - b. Replace the rear drives SCSI ID cable.
  - c. Replace the rear drives power cable.
  - d. Replace the power backplane-to-SCSI backplane cable.
  - e. Replace SCSI backplane.
  - f. Replace power backplane.
  - g. Replace hard drive.
- 8 If the boot drive is in the front drive bay, move the hard drive to another front drive bay slot and try starting up the server. **Note:** You may have to reconfigure the system startup path using Open Firmware. If the server does not boot,
  - a. Replace the 68-pin SCSI hard drive cable.
  - b. Replace SCSI ID cable.
  - c. Replace hard drive power cable.

- d. Replace SCSI backplane.
- e. Replace hard drive.
- f. Replace logic board. Retain customer's DIMMs.
- g. Replace processor card.

Long DRAM test never completes

Verify that each DRAM DIMM is properly seated.

System will not boot and a memory failure is indicated on lines 1 and 2 of the LCD with ECCBEBAD as the failed address

Verify DIMM specifications. ECC memory DIMMs with non-quad CAS logic are not supported.

## System

## Solutions

Clicking, chirping, or thumping\*

- 1 Verify that fans are not loose. Replace if necessary. The fans are hot-swappable and can be replaced without shutting down the server.
- 2 Verify that power supply is properly seated. Replace if necessary. Network Server 700/150 power supply is hot-swappable and may be replaced without shutting down the server.
- 3 Verify that all front drive trays are completely inserted.
- 4 Check hard drive(s). Replace if necessary.
- 5 Check DAT drive. Replace if necessary.
- 6 Check floppy drive. Replace if necessary.
- 7 Replace logic board. Retain customer's DIMMs.
- 8 Replace processor card.

System shuts down intermittently

- 1 Verify that power cord is firmly plugged in.
- 2 Verify that fans are working. Replace if necessary.
- 3 Verify that all front drive trays are completely inserted. Improper installation may disrupt air flow.
- 4 Verify that air vents are clear. Thermal-protection circuit may shut down system. After 30 – 40 minutes, system should be OK.
- 5 Run Network Server Diagnostic Utility and follow the instructions provided with the utility to verify core system operations.
- 6 Check battery.

\* Noises may not necessarily require a replacement of component. For example, a noisy fan may be more annoying than a cause of concern.

	7	Reset Cuda chip. (Refer to Resetting the Cuda Chip in "Troubleshooting Procedures.")
	8	Reset logic board. (Refer to Resetting the Logic Board in "Troubleshooting Procedures.")
	9	Replace power cord.
	10	Replace power supply.
	11	Replace powerplane interconnect board.
	12	Replace logic board. Retain customer's DIMMs.
	13	Replace processor card.
System intermittently crashes or hangs	1	Verify that power cord is firmly connected.
	2	Verify that power supply is properly seated.
	3	Verify that rear drawer is properly seated.
	4	Verify that all front drive trays are properly seated.
	5	Verify system software is version 4.1.4 or later. (Refer to <i>Using AIX, AppleTalk Services, and Mac OS Utilities on the Network Server</i> for information on installing and using the operating system).
	6	Run Network Server Diagnostic Utility and follow the instructions provided with the utility to verify core system operations.
	7	Verify that system is using fast-paged mode, 60 ns or faster RAM access time DIMMs.
	8	Reseat processor card.
	9	Reseat cache DIMM.
	10	Remove all DRAM DIMMs and replace them one at a time to test. Replace any bad DIMMs.
	11	Remove all PCI cards and test unit. If problem does not occur with cards removed, replace them one at a time to determine which card is causing the problem. Replace problem card with known-good card.
	12	Replace logic board. Retain customer's DIMMs.
	13	Replace processor card.
System is inactive	1	Verify that power LED is on.
	2	Check for three-digit error code on LCD panel. If display is not blank, refer to "Chapter 10: Troubleshooting" in <i>Using AIX, AppleTalk Services, and Mac OS Utilities on the Network Server</i> for possible error codes and recommended actions.
	3	Verify that all cables are properly connected and secure.



Three-digit error code is displayed on LCD panel during startup process

#### Video

Screen is black, drive operates, and fan is running

- 4 Adjust brightness on monitor.
- 5 Press Control-D or Control-C to cancel any stalled processes.
- 6 Verify that key in rear drawer is in horizontal (locked) position.
- 7 Restart system.
- 8 Run Network Server Diagnostic Utility to verify core system operations.

For possible error codes and recommended actions, refer to "Chapter 10: Troubleshooting" of *Using AIX, AppleTalk Services, and Mac OS Utilities on the Network Server*.

#### Solutions

- 1 Verify that the monitor is a SVGA or Multiple Scan model.
- 2 If the system is using a video extender cable, verify that it is rated for use with Multiple Scan monitors.
- 3 Adjust brightness on monitor.
- 4 Verify that monitor cable is firmly attached to both the monitor and server.
- 5 Verify that the system is configured to connect to a serial terminal. (For information on how to connect the Network Server to a serial terminal refer to "Connecting a Serial Terminal" in Chapter 3 of *Setting Up the Network Server*.)
- 6 Run Network Server Diagnostic Utility to verify core system operations.
- 7 Reset Cuda chip. (Refer to Resetting the Cuda Chip in "Troubleshooting Procedures.")
- 8 Reset logic board. (Refer to Resetting the Logic Board in "Troubleshooting Procedures.")
- 9 Test with known-good monitor. Replace monitor if necessary. Refer to appropriate monitor manual to troubleshoot defective monitor.
- 10 Replace monitor cable.
- 11 Replace logic board. Retain customer's DIMMs.
- 12 Replace processor card.

Screen lights up, but nothing is displayed on screen	<ol style="list-style-type: none"> <li>1 Verify that the monitor is a SVGA or Multiple Scan model.</li> <li>2 If the system is using a video extender cable, verify that it is rated for use with Multiple Scan monitors.</li> <li>3 Reset Cuda chip. (Refer to Resetting the Cuda Chip in "Troubleshooting Procedures.")</li> <li>4 Reset logic board. (Refer to Resetting the Logic Board in "Troubleshooting Procedures.")</li> <li>5 Test with known-good monitor. Replace monitor if necessary. Refer to appropriate monitor manual to troubleshoot defective monitor.</li> <li>6 Run Network Server Diagnostic Utility to verify core system operations.</li> <li>7 Replace monitor cable.</li> <li>8 Replace logic board. Retain customer's DIMMs.</li> <li>9 Replace processor card.</li> </ol>
Screen has white area with blotches of color	<ol style="list-style-type: none"> <li>1 Move unit to another location.</li> <li>2 Degauss display with manual degaussing coil. (Degaussing coil can be purchased at most major electronic parts stores.)</li> </ol>
Size of text/graphics differs at top, bottom, or sides of screen	<ol style="list-style-type: none"> <li>1 Replace monitor cable.</li> <li>2 Replace monitor.</li> </ol>
Out of focus	<ol style="list-style-type: none"> <li>1 Perform focus adjustment.</li> <li>2 Replace monitor.</li> </ol>
Black screen spots	Replace monitor.
Screen jitters or flashes	<ol style="list-style-type: none"> <li>1 Verify that the monitor is a SVGA or Multiple Scan model.</li> <li>2 If the system is using a video extender cable, verify that it is rated for use with Multiple Scan monitors.</li> <li>3 Verify that monitor cable is firmly attached to both monitor and server.</li> <li>4 Check for external interference.</li> <li>5 Replace monitor.</li> </ol>
Objects on screen appear too large or distorted	Adjust display resolution. (Refer to Chapter 10: Troubleshooting in <i>Using AIX, AppleTalk Services, and Mac OS Utilities on the Network Server</i> .)

## SCSI Devices

Server does not recognize SCSI device(s)

## Solutions

Refer to Troubleshooting SCSI Devices in the "Troubleshooting Procedures."

## Hard Drive

Single internal hard drive in front drive bay doesn't operate; drive doesn't spin

## Solutions

- 1 Verify that hard drive tray is completely inserted in front drive bay.
- 2 Verify that server is recognizing the drive on SCSI bus. (Refer to Troubleshooting SCSI Devices in "Troubleshooting Procedures.")
- 3 Verify that installed SCSI devices and PCI cards are not exceeding maximum power allowance, which may affect operation of installed devices.
- 4 Run Network Server Diagnostic Utility to verify core system operations.
- 5 Move the hard drive to another front drive bay slot.
- 6 Verify that hard drive SCSI cable, SCSI ID cable, LED cable, and power cable are properly connected.
- 7 Replace hard drive power cable.
- 8 Replace hard drive SCSI cable.
- 9 Replace hard drive SCSI ID cable.
- 10 Replace hard drive. (Refer to *Setting Up the Network Server* for information on installing disk drives.)
- 11 Replace SCSI backplane interconnect board.

(Network Server 700/150 only)  
Single internal hard drive in the rear drive bracket doesn't operate; drive doesn't spin

- 1 Verify that server is recognizing the internal rear hard drive on SCSI bus. (Refer to Troubleshooting SCSI Devices in "Troubleshooting Procedures.")
- 2 Verify that installed SCSI devices and PCI cards are not exceeding maximum power allowance, which may affect operation of installed devices.
- 3 Run Network Server Diagnostic Utility to verify core system operations.
- 4 Verify that internal rear hard drive SCSI cable, SCSI ID cable, and power cable are properly connected.
- 5 Verify that the last bracket-mounted drive on the SCSI cable has termination enabled.
- 6 If the rear drive bracket contains just one hard drive, verify that it is connected to the last connector on the SCSI cable.

No internal hard drive in front drive bay operates

- 7 If the rear drive bracket contains two hard drives, verify that the SCSI ID cable and the last connector on the SCSI cable are both connected to the bottom hard drive.
  - 8 Verify that power backplane-to-SCSI backplane cable is properly connected.
  - 9 Verify that 10-inch and 20-inch mezzanine-to-SCSI backplane cables are properly connected.
  - 10 Replace rear drive power cable.
  - 11 Replace rear drive SCSI cable.
  - 12 Replace rear drive SCSI ID cable.
  - 13 Replace 10-inch and 20-inch mezzanine-to-SCSI backplane cables.
  - 14 Replace SCSI backplane interconnect board.
  - 15 Replace hard drive. (Refer to *Setting Up the Network Server* for information on installing disk drives.)
- 
- 1 Verify that all hard drive trays are completely inserted in their respective front drive bays.
  - 2 Verify that server is recognizing the hard drives in the front drive bays on SCSI bus. (Refer to Troubleshooting SCSI Devices in "Troubleshooting Procedures.")
  - 3 Verify that installed SCSI devices and PCI cards are not exceeding maximum power allowance, which may affect operation of installed devices.
  - 4 Run Network Server Diagnostic Utility to verify core system operations.
  - 5 Verify that power backplane-to-SCSI backplane cable is properly connected.
  - 6 Verify that 10-inch and 20-inch mezzanine-to-SCSI backplane cables are properly connected.
  - 7 Replace 10-inch and 20-inch mezzanine-to-SCSI backplane cables.
  - 8 Replace power backplane-to-SCSI backplane power cable.
  - 9 Replace SCSI backplane interconnect board.
  - 10 Replace powerplane interconnect board.
  - 11 Replace logic board. Retain customer's DIMMs.
  - 12 Replace processor card.

(Network Server 700/150 only)  
No internal hard drives in the  
rear drive bracket operate

- 1 Verify that internal hard drives in the rear drive bracket do not have duplicate SCSI device addresses.
- 2 Verify that server recognizes the internal rear hard drives on SCSI bus. (Refer to Troubleshooting SCSI Devices in "Troubleshooting Procedures.")
- 3 Verify that installed SCSI devices and PCI cards are not exceeding maximum power allowance, which may affect operation of installed devices.
- 4 Run Network Server Diagnostic Utility to verify core system operations.
- 5 Verify that rear drives SCSI cable, SCSI ID cable, and power cable are properly connected.
- 6 Verify that the last bracket-mounted drive on the SCSI cable has termination enabled.
- 7 Verify that the SCSI ID cable and the last connector on the SCSI cable are both connected to the bottom hard drive.
- 8 Verify that power backplane-to-SCSI backplane cable is properly connected.
- 9 Verify that 10-inch and 20-inch mezzanine-to-SCSI backplane cables are properly connected.
- 10 Replace rear drives SCSI cable.
- 11 Replace rear drives SCSI ID cable.
- 12 Replace rear drives power cable.
- 13 Replace 10-inch and 20-inch mezzanine-to-SCSI backplane cables.
- 14 Replace SCSI backplane interconnect board.
- 15 Replace power backplane-to-SCSI backplane power cable.
- 16 Replace powerplane interconnect board.
- 17 Replace logic board. Retain customer's DIMMs.
- 18 Replace processor card.



---

## **Floppy Drive**

Internal floppy drive does not operate

### **Solutions**

- 1 Use a known-good floppy disk.
- 2 Verify that mezzanine-to-floppy drive cable is properly connected.
- 3 Verify that rear drawer is properly installed.
- 4 Replace floppy drive.
- 5 Replace mezzanine-to-floppy drive cable.
- 6 Replace mezzanine interconnect board.
- 7 Replace logic board. Retain customer's DIMMs.

Does not eject disk

- 1 To eject a previously inserted disk, insert an opened paper clip into hole beneath floppy drive.
- 2 Reseat floppy drive bezel and floppy drive so that bezel slot aligns correctly with floppy drive.
- 3 Verify that rear drawer is properly installed.
- 4 Replace floppy drive.
- 5 Replace mezzanine-to-floppy drive cable.
- 6 Replace mezzanine interconnect board.
- 7 Replace logic board. Retain customer's DIMMs.

## **CD-ROM Drive**

CD-ROM drive does not work

### **Solutions**

- 1 Use a known-good compact disc.
- 2 Reseat CD-ROM drive.
- 3 Move CD-ROM drive to another front drive bay slot.
- 4 Verify that server is recognizing CD-ROM drive on SCSI bus. (Refer to Troubleshooting SCSI Devices in "Troubleshooting Procedures.")
- 5 Verify that installed SCSI devices and PCI cards are not exceeding maximum power allowance, which may effect operation of installed devices.
- 6 Run Network Server Diagnostic Utility to verify core system operations.
- 7 Verify that CD-ROM drive SCSI cable, SCSI ID cable, and power cable are properly connected.
- 8 Replace CD-ROM drive.
- 9 Replace SCSI backplane board.
- 10 Replace logic board. Retain customer's DIMMs.

Volume control does not operate correctly

- 1 Reseat CD-ROM drive.
- 2 Move CD-ROM drive to another front drive bay slot.
- 3 Verify that CD-ROM drive SCSI cable, SCSI ID cable, and power cable are properly connected.
- 4 Replace CD-ROM drive.
- 5 Replace SCSI backplane board.
- 6 Replace logic board. Retain customer's DIMMs.

### DAT Drive

DAT drive does not work

### Solutions

- 1 Verify that DAT tape conforms to DDS-2 standards.
- 2 Use a known-good tape.
- 3 Move the DAT drive to another front drive bay slot.
- 4 Verify that server is recognizing DAT drive on SCSI bus. (Refer to Troubleshooting SCSI Devices in "Troubleshooting Procedures.")
- 5 Verify that installed SCSI devices and PCI cards are not exceeding maximum power allowance, which may affect operation of installed devices.
- 6 Run Network Server Diagnostic Utility to verify core system operations.
- 7 Verify that DAT drive SCSI cable, SCSI ID cable, and power cable are properly connected.
- 8 Replace DAT drive.
- 9 Replace SCSI backplane board.
- 10 Replace logic board. Retain customer's DIMMs.

Self-test fails and right light flashes amber

Clean tape drive head. (Refer to Cleaning the Tape Drive Heads in *Setting Up the Network Server*.)

Amber light flashes when tape is loaded in tape drive

Copy data to new tape and discard old tape; it is worn out.

Self-test fails and right light is solid amber

- 1 Move DAT drive to another front drive bay slot.
- 2 Replace DAT drive.
- 3 Replace SCSI backplane board.
- 4 Replace logic board. Retain customer's DIMMs.

---

## Peripherals

## Solutions

Cursor does not move

- 1 Check mouse connection.
- 2 Inspect inside of mouse for buildup of dirt or other contaminants. Clean mouse if necessary.
- 3 If mouse was connected to keyboard, connect mouse to computer ADB port instead. If mouse works, replace keyboard.
- 4 Replace ADB cable.
- 5 If mouse does not work in any ADB port on computer, replace mouse.
- 6 Replace logic board. Retain customer's DIMMs.
- 7 Replace processor card.

Cursor moves, but clicking mouse button has no effect

- 1 If mouse was connected to keyboard, connect mouse to computer ADB port instead. If mouse works, replace keyboard. If mouse does not work in any ADB port on computer, replace mouse.
- 2 Replace logic board. Retain customer's DIMMs.

No response to any key on keyboard

- 1 Verify that server is properly configured to connect to a serial terminal. (Refer to *Setting Up the Network Server* for information on how to connect the server to a serial terminal.)
- 2 Verify that keyboard is an ADB-compatible extended keyboard.
- 3 Check keyboard connection to ADB port.
- 4 Replace keyboard cable.
- 5 Replace keyboard.
- 6 Replace logic board. Retain customer's DIMMs.

## Miscellaneous

## Solutions

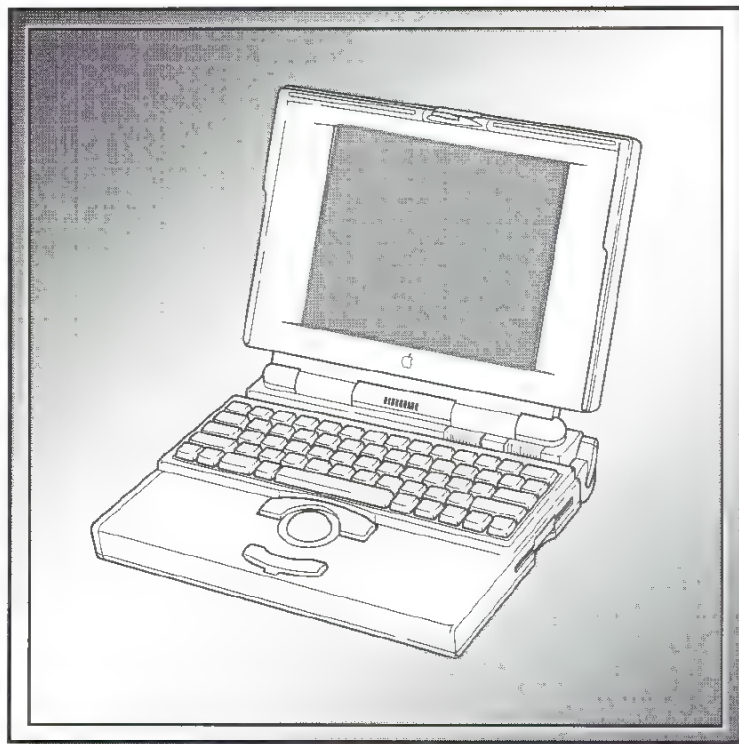
No sound from speaker

- 1 Verify that LCD/Speaker/Keylock cable is properly connected.
- 2 Replace speaker.
- 3 Replace mezzanine interconnect board.
- 4 Replace logic board. Retain customer's DIMMs.

No sound from known-good external speakers

- 1 Check that volume is turned on.
- 2 Verify that speaker connectors are properly connected.
- 3 Test speakers with known working Macintosh. If speakers do not work, replace them.
- 4 Replace logic board. Retain customer's DIMMs.

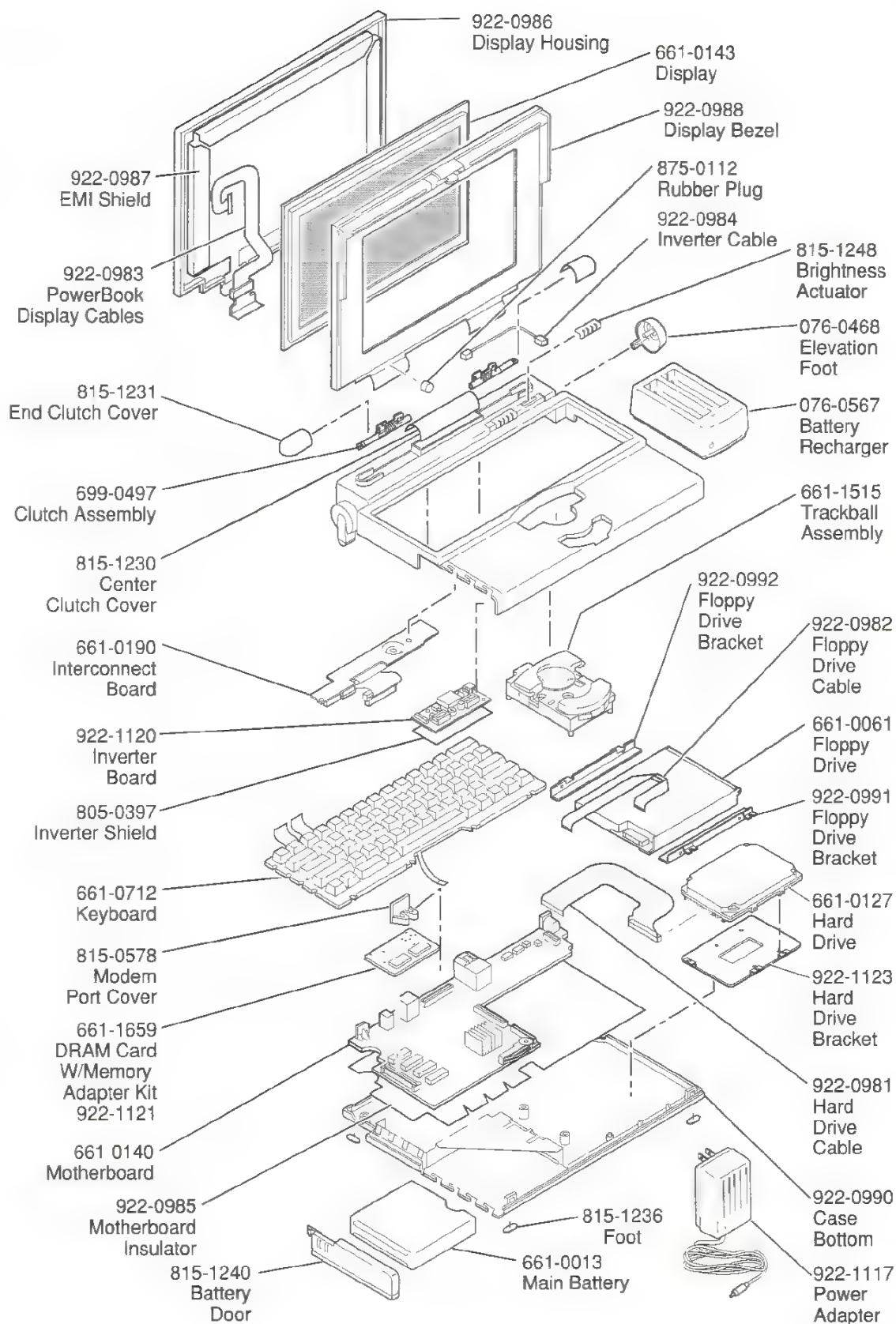
# Macintosh PowerBook 150



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## Exploded View

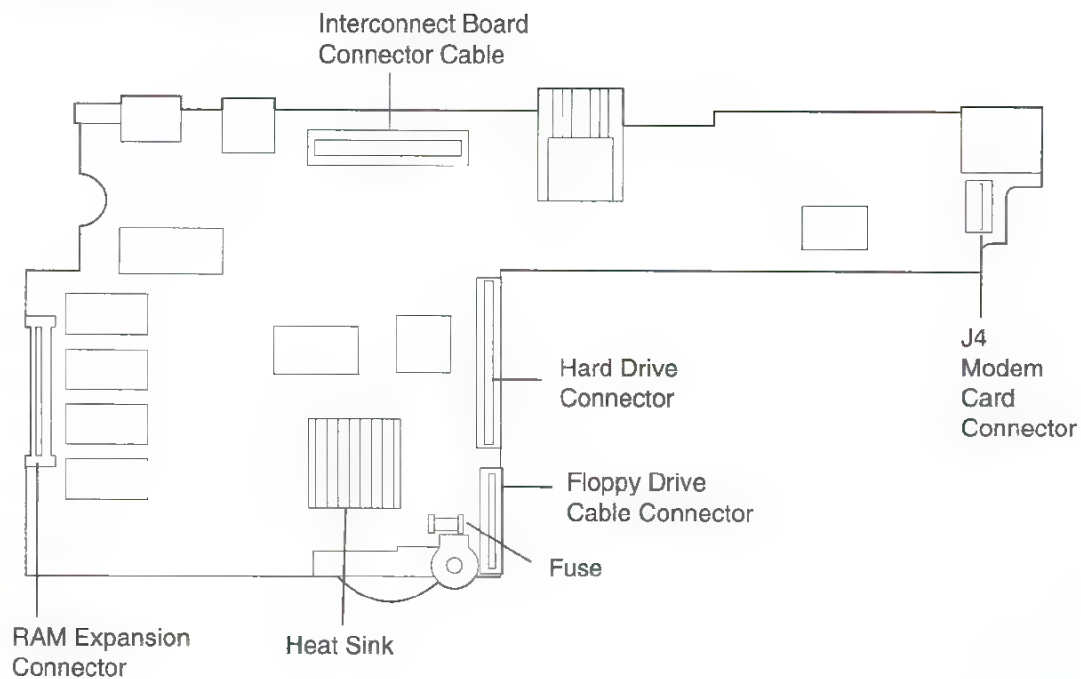


**Figure 57. PowerBook 150 Exploded View**

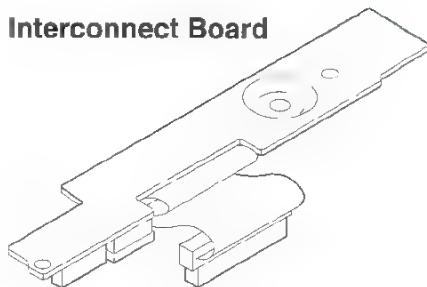


## Logic and Other Boards

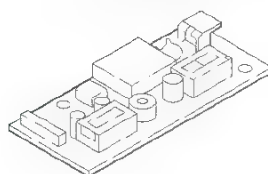
### PowerBook 150 Motherboard



### Interconnect Board



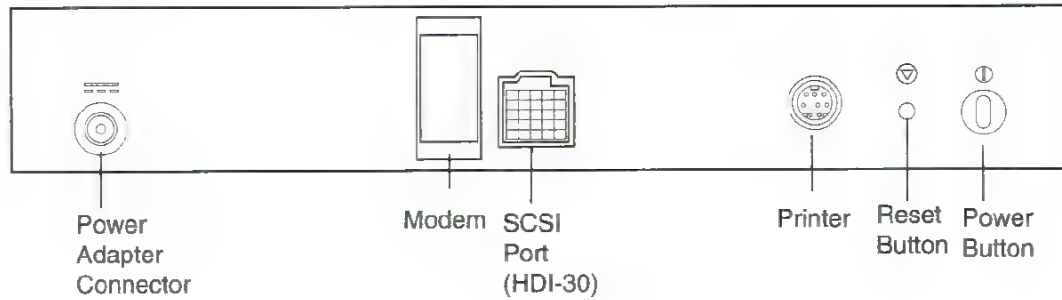
### Inverter Board



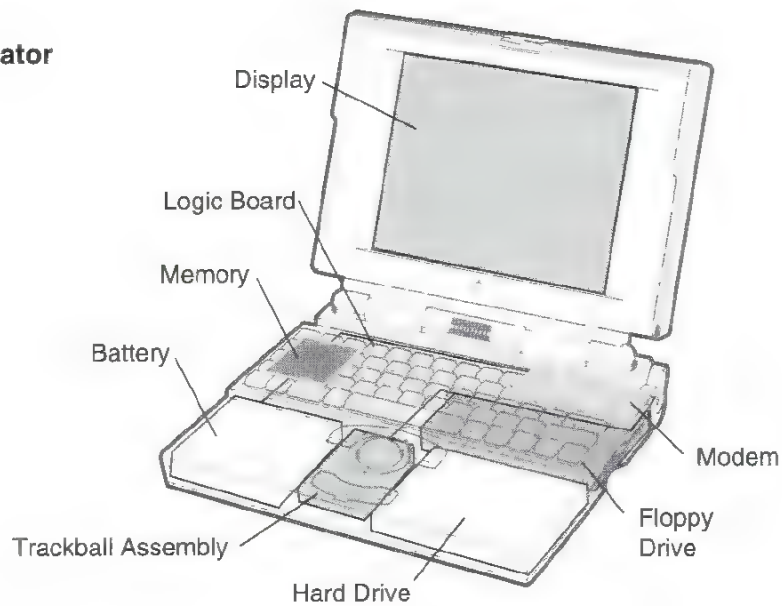
**Figure 58. PowerBook 150 Logic and Other Boards**

## Back Panel and Locator View

### Back Panel



### Locator



**Figure 59. PowerBook 150 Back Panel and Locator View**

## Parts List

Battery Door .....	815-1240
Battery, External, Recharger .....	076-0567
Battery, Nicad, 2.9 Amp Hr .....	661-0013
Battery, Nicad, Case .....	076-1539
Bezel, Display .....	922-0988
Bracket, Floppy, Left (Pkg. of 10) .....	922-0991
Bracket, Floppy, Right (Pkg. of 10) ....	922-0992
Bracket, HDA, with Spacer (Pkg. of 10) .....	922-1123
Brightness Actuator, .....	815-1248
Cable, Display, Inverter .....	922-0984
Cable, Display, Ribbon (Pkg. of 5) .....	922-0983
Cable, Flex, Floppy Drive (Pkg. of 5) .....	922-0982
Cable, Hard Drive (Pkg. of 5) .....	922-0981
Case, Bottom w/Labels .....	922-0990
Case, Top .....	922-0989
Clutch, Center, Cover .....	815-1230
Clutch End Cover .....	815-1231
Clutch, Left Assembly .....	699-0497
Clutch, Right Assembly .....	699-0498
Contrast Actuator .....	815-1247
Display, FSTN .....	661-0143
DRAM Expansion Card, 4 MB .....	661-1659
DRAM Expansion Card, 8 MB .....	661-1658
Drive, Floppy, 1.4 MB .....	661-0061
Foot, Rubber .....	815-1236
Fuse, 5 A (Pkg. of 20) .....	922-1180
Hard Drive, 250 MB, 2.5", IDE .....	661-0046
HDA, 120 MB, 2.5", IDE .....	661-0127
Housing, Display .....	922-0986
Insulator, Motherboard (Pkg. of 5) .....	922-0985
Interconnect Board .....	661-0190
Inverter Shield .....	805-0397
Keyboard, British .....	B661-0712
Keyboard, Czechoslovakian .....	CZ661-0712
Keyboard, Danish .....	DK661-0712
Keyboard, French Canadian .....	C661-0712
Keyboard, French .....	F661-0712
Keyboard, German .....	D661-0712
Keyboard, Hamburg Grey (German) .....	D661-1680
Keyboard, International .....	Z661-0712
Keyboard, Italian .....	T661-0712
Keyboard, Japanese, Kana (Replaced by J661-0712) .....	JK661-0712
Keyboard, Japanese .....	J661-0712

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Keyboard, Norwegian .....	H661-0712
Keyboard, Portuguese .....	PO661-0712
Keyboard, Spanish .....	E661-0712
Keyboard, Swedish .....	S661-0712
Keyboard, Swiss French .....	SF661-0712
Keyboard, Turkish .....	TU661-0712
Keyboard, U.S. ....	661-0712
Keyboard, Gasket, EMI (Pkg. of 10) .....	076-0477
Kit, Elevation Foot .....	076-0468
Logic Board, Inverter .....	922-1120
Logic Board, Motherboard .....	661-0140
Memory Adapter Kit .....	922-1121
Modem Port Cover .....	815-0578
Power Adapter, Australia .....	X922-1117
Power Adapter, Europe .....	Z922-1117
Power Adapter, United Kingdom .....	B922-1117
Power Adapter, U.S./Japan .....	922-1117
Rubber Plug, Display Bezel .....	875-0112
Screw Kit .....	076-0556
Screw, Floppy Bracket to Floppy Drive, Torx M2x4 .....	922-1683
Screw, Hard Drive Bracket to Hard Drive, MacFet M3x.5x4 .....	922-1682
Screws, Modem, PB (Pkg. of 5) .....	076-0575
Shield, Display EMI (Pkg. of 5) .....	922-0987
Trackball Assembly .....	661-1515
Trackball Ball .....	949-0362
Trackball Retainer .....	949-0363

## Specifications

**Table 10. Macintosh PowerBook 150 Specifications**

<b>Processor</b>	Motorola 68030 microprocessor: 33 MHz Addressing: 32-bit internal registers, address bus, and 32-bit data bus
<b>Memory</b>	RAM: 4 MB, expandable to 40 MB ROM: 1 MB PRAM: 256 bytes of parameter memory VRAM: 256K of static video display memory Clock/Calendar: CMOS custom chip
<b>Disk Storage</b>	Floppy Drive: 19 mm high, 1.4 MB Apple SuperDrive Hard Drive: 2.5 in., 120 MB IDE hard drive
<b>I/O Interfaces</b>	SCSI: HDI-30 SCSI port with 1.5 MB/sec. transfer rate; supports up to six external SCSI devices; connect SCSI device to computer with HDI-30 SCSI system cable Serial: One RS-422 serial port; mini DIN-8 connector
<b>I/O Devices</b>	Keyboard: Built-in standard Apple keyboard 63 keys domestic; 64 keys ISO; 18 mm vertical pitch; 18.63 mm horizontal pitch; two-level tilt adjustment Trackball: 30 mm diameter, dual button Apple Desktop Bus (ADB) interface
<b>Sound and Video</b>	Sound Generator: Apple sound chip provides 8-bit sound capable of driving stereo headphones or other stereo equipment through the sound jack Video Display: 9.5 in. diagonal screen, flat-panel, film-compensated supertwist nematic (FSTN) liquid crystal display; 640 lines by 480 pixels
<b>Electrical</b>	Main Battery: Nickel cadmium (NiCad) battery. Provides 2–4 hours of usage before recharging Power Adapter: 110–240 VAC line voltage, 50–60 Hz. US, Japanese, United Kingdom, Australian, and European versions
<b>Physical</b>	Height: 2.3 in. (5.8 cm) Width: 11.3 in. (28.7 cm) Depth: 9.3 in. (23.6 cm) Weight: 5.5 lb. (2.5 kg) with battery
<b>Environmental</b>	Operating Temperature: 50–95° F (10–35° C) Storage Temperature: 14–140° F (-10–60° C) Relative Humidity: 20–80% noncondensing Operating Altitude: 0–10,000 ft. (0–3048 m) Shipping Altitude: 0–15,000 ft. (0–4722 m)



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## Troubleshooting Procedures

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### Resetting the Power Manager

If a unit crashes or experiences power problems, reset the power manager chip by pressing the rear power switch for 30-45 seconds.

If resetting the power manager chip does not solve the problem, reset the code for the power manager chip by removing all power sources and letting the unit sit for 10 minutes. (Take out the battery and disconnect the AC adapter and the internal backup battery.) This forces the PowerBook to reload the power manager code from the system software.

---

### Resetting the Parameter RAM (PRAM)

To reset or zap the PRAM, restart the computer while holding down the Command-Option-P-R keys.

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## Symptom/Cure Chart

This Symptom/Cure Chart will help you diagnose specific symptoms related to your product. Because the most likely solution is listed first, try the first-listed solution. Verify whether or not the product continues to exhibit the symptom. If the symptom persists, try the next solution. (Note: If you have replaced a module, reinstall the original module before you proceed to the next solution.)

For additional assistance, contact Apple Technical Support.

### Error Chords

### Solutions

RAM failure occurs (eight-tone error chord sequence sounds after start-up chord)

- 1 Replace RAM expansion card.
- 2 Replace memory adapter.
- 3 Replace logic board.

Hardware failure occurs (four-tone error chord sequence sounds after start-up chord)

- 1 Disconnect hard drive data cable and reboot system. If start-up sequence is normal, replace hard drive.
- 2 Disconnect floppy drive cable and reboot system. If start-up sequence is normal, replace floppy drive.
- 3 Replace logic board.

Screen displays checker-board pattern; no start-up chime

- 1 Remove RAM card. If no problem found, replace RAM expansion card.
- 2 Reseat display cable.
- 3 Replace logic board.

### Power

### Solutions

Screen is blank; computer doesn't respond

- 1 Press reset switch.
- 2 Connect power adapter and reboot computer in 3–4 minutes.
- 3 Try known-good, charged main battery.
- 4 Check all interconnect board and logic board connections.
- 5 Reset the power manager (see Resetting the Power Manager at the beginning of this section).
- 6 Replace keyboard.
- 7 Replace interconnect board.
- 8 Replace logic board.

After removing main battery, some Control Panel settings are different

- 1 Replace interconnect board.
- 2 Replace logic board.

Power adapter is plugged in,  
but battery DA does not  
indicate charger is connected

- 1 Check battery charger connection.
- 2 Try known-good, charged main battery.
- 3 Try known-good power adapter.
- 4 Replace logic board.

Low-power warning appears

- 1 Recharge battery or attach power adapter.
- 2 Verify that peripherals are low-power.
- 3 Reduce use of power-consuming devices or connect power adapter.
- 4 Try known-good, charged main battery.
- 5 Try known-good power adapter.
- 6 Replace logic board.

Computer runs when plugged  
in to wall outlet but not on  
battery power; battery voltage  
is within tolerance

- 1 Reseat battery to make sure battery is mating with contacts on logic board.
- 2 Replace fuse on logic board.
- 3 Replace logic board.
- 4 Return computer to Apple for service.

## Video

Row or partial row of pixels  
never comes on or is always  
on

## Solutions

- 1 Replace display cable.
- 2 Replace display.
- 3 Replace interconnect board.

Thin white line is always on at  
middle of screen

Thin white line is normal for FSTN screens.

Display is very light or totally  
white

- 1 Adjust screen contrast.
- 2 Adjust screen brightness.
- 3 Check display cable, inverter board, interconnect board, and logic board connections.
- 4 Replace inverter board.
- 5 Replace interconnect board.
- 6 Replace display cable.
- 7 Replace display.
- 8 Replace logic board.

No display, but computer  
appears to operate correctly

- 1 Adjust screen contrast.
- 2 Check display cable, inverter board, interconnect board, and logic board connections.
- 3 Replace inverter board.
- 4 Replace interconnect board.
- 5 Replace power cable.
- 6 Replace display cable.
- 7 Replace display.
- 8 Replace logic board.

Rainbow colors visible from  
extreme viewing angles

Such colors are normal for FSTN screens.

Image is not uniform	Irregularity in images is normal for FSTN screens. Adjust contrast and brightness to diminish effect.
Display stopped working or dimmed but is fine now	If temperature is under 5 or over 40 degrees centigrade, this reaction is normal for FSTN screens.
Backlight doesn't operate	<ol style="list-style-type: none"> <li>1 Check display cable, inverter board, interconnect board, and logic board connections.</li> <li>2 Replace inverter board.</li> <li>3 Replace inverter cable.</li> <li>4 Replace interconnect board.</li> <li>5 Replace display.</li> <li>6 Replace logic board.</li> </ol>
Screen goes blank	<ol style="list-style-type: none"> <li>1 Press any key to wake computer from system sleep.</li> <li>2 Check display cable connection.</li> </ol>
Pixel is always white or always black	Replace display.

## Floppy Drive

## Solutions

Audio and video present, but internal drive does not operate	<ol style="list-style-type: none"> <li>1 Try known-good floppy disk.</li> <li>2 Check floppy drive cable connection.</li> <li>3 Replace floppy drive cable.</li> <li>4 Replace floppy drive.</li> <li>5 Replace logic board.</li> </ol>
Disk ejects while booting; display shows Mac icon with blinking X	<ol style="list-style-type: none"> <li>1 Try known-good system disk.</li> <li>2 Verify that trackball or mouse button is not stuck.</li> <li>3 Check floppy drive cable connection.</li> <li>4 Replace floppy drive cable.</li> <li>5 Replace floppy drive.</li> <li>6 Replace logic board.</li> </ol>
Disk does not eject	<ol style="list-style-type: none"> <li>1 Switch off system and hold mouse button down while you switch system on.</li> <li>2 Insert opened paper clip into hole beside drive.</li> <li>3 Check floppy drive cable connection.</li> <li>4 Replace floppy drive cable.</li> <li>5 Replace floppy drive.</li> <li>6 Replace logic board.</li> </ol>
Disk initialization fails	<ol style="list-style-type: none"> <li>1 Try known-good floppy disk.</li> <li>2 Install inverter shield.</li> <li>3 Check floppy drive cable connection.</li> <li>4 Replace floppy drive cable.</li> <li>5 Replace floppy drive.</li> </ol>

Read/write/copy error

- 1 Try known-good floppy disk.
- 2 Install inverter shield.
- 3 Check floppy drive cable connection.
- 4 Replace floppy drive cable.
- 5 Replace floppy drive.

## Hard Drive

Internal hard drive does not operate

### Solutions

- 1 Make sure power adapter is connected.
- 2 Check hard drive cable connection.
- 3 Replace hard drive cable.
- 4 Replace hard drive.
- 5 Replace logic board.

## Peripherals

After connecting external SCSI device, computer doesn't boot

### Solutions

- 1 Switch on external SCSI device before starting computer.
- 2 Check cable connections.
- 3 Verify that standard Apple terminator terminates end of SCSI chain.
- 4 Verify that SCSI select switch setting on external device is unique.
- 5 Verify operation of internal hard drive.
- 6 Try known-good external SCSI device.
- 7 Replace logic board.

Cursor does not move when using trackball

- 1 Press reset switch
- 2 Check trackball connection.
- 3 Replace trackball assembly.
- 4 Check interconnect board and logic board connections.
- 5 Replace interconnect board.
- 6 Replace logic board.

Cursor intermittently does not move or moves erratically

- 1 Clean ball and rollers of trackball.
- 2 Replace trackball.
- 3 Replace keyboard.
- 4 Replace interconnect board.
- 5 Replace logic board.

Cursor moves, but clicking trackball button has no effect

- 1 Check interconnect board and logic board connections.
- 2 Replace trackball.
- 3 Replace keyboard.
- 4 Replace interconnect board.
- 5 Replace logic board.



No response to any key on keyboard

- 1 Reset power manager (see Resetting the Power Manager at the beginning of this section).
- 2 Check connections of keyboard to interconnect board.
- 3 Replace keyboard.
- 4 Replace interconnect board.
- 5 Replace logic board.

Known-good Image-Writer, ImageWriter II, or LQ does not print

- 1 Verify that system software is current.
- 2 Verify that Chooser and Control Panel settings are correct and that AppleTalk is off.
- 3 Check cables.
- 4 Replace printer interface cable.
- 5 Try known-good printer.
- 6 Replace logic board.

Known-good LaserWriter does not print

- 1 Verify that system software is current.
- 2 Verify that Chooser and Control Panel settings are correct and that AppleTalk is on.
- 3 Check cables.
- 4 Replace printer interface cable.
- 5 Troubleshoot network. Refer to Networking and Communications manual.
- 6 Replace logic board.

Device connected to external printer port doesn't work

- 1 Verify that system software is current.
- 2 Verify third-party setup software. Ensure the printer port is selected in the application's preferences.
- 3 Check cables.
- 4 Attach device to known-good computer.
- 5 Replace logic board.

I/O devices are unrecognized or garbage is transmitted or received

- 1 Verify that system software is current.
- 2 Check cables.
- 3 Verify that SCSI device has standard Apple terminator.
- 4 Verify that SCSI select switch setting on external device is unique.
- 5 Attach device to known-good computer.
- 6 Replace logic board.

---

## Internal Modem

Modem does not respond properly to AT command set instructions

## Solutions

- 1 Verify that baud rate and data format settings of communications application are compatible with internal modem and remote modem.
- 2 Check phone cord connection and operation.
- 3 Remove and reseat modem card.
- 4 Verify that system software is current.
- 5 Replace modem card.

Strange mix of characters appears on screen

- 1 Verify that baud rate and data format settings of communications application are compatible with internal modem and remote modem.
- 2 Check phone cord connection and operation.
- 3 Remove and reseat modem card.
- 4 Verify that system software is current.
- 5 Replace modem card.
- 6 Replace logic board.

Modem interferes with system sound

- 1 Remove and reseat modem card.
- 2 Replace modem card.
- 3 Replace interconnect board.
- 4 Replace logic board.

Modem does not respond to incoming call

- 1 If computer is in sleep mode, verify that Wake On Ring option in CDEV is selected.
- 2 Check phone cord connection and operation.
- 3 Replace modem card.
- 4 Replace logic board.

Modem has no sound output

- 1 Verify that Control Panel volume setting is above 0.
- 2 Replace modem card.
- 3 Replace interconnect board.
- 4 Replace logic board.

Modem connects but does not communicate with remote modem

- 1 Verify that remote modem needs error correction (error correction is internal modem default).
- 2 If remote modem does not need error correction, type AT&Q0 to disable error correction.

## Miscellaneous

Screen goes blank and computer shuts down every few minutes

## Solutions

Adjust sleep delays in Control Panel or connect power adapter.

---

Application seems to run  
slower after few seconds

Connect power adapter.

Hard drive is slow to respond,  
or screen goes blank too often

Adjust sleep delays in Control Panel or connect power  
adapter.

No sound from speaker

- 1 Verify that volume setting in Control Panel is 1 or  
above.
- 2 Check connection of interconnect board to logic  
board.
- 3 Replace interconnect board.
- 4 Replace logic board.

---

## Upgrades

- ▲Caution**      **The PowerBook 150 contains CMOS devices that are very susceptible to ESD damage. Review the ESD precautions in Chapter 1, Safety.**

---

### Internal FAX/Data Modem Card

The Internal FAX/Data modem card is a service-only option for the PowerBook 150. To install the modem,

1. Remove the main battery and top case.
2. Pinch the release tabs and push out the modem port cover.
3. Connect the modem card connector to connector J4 on the logic board.
4. Install the two mounting screws.

- Note**      The PowerBook 150 does not support the Express Modem.

---

### RAM Expansion Card

- ▲Caution**      **Handle the RAM expansion card by the edges only. Do not touch any components on the card.**

This procedure explains how to install the RAM expansion card kit. The kit is an option for the PowerBook 150 and includes a RAM expansion card, adapter, brace, and mounting screw.

1. Remove the main battery and top case.

- ▲Caution**      **Be careful not to flex the RAM card when inserting it into the adapter. Connect the card to the adapter by holding onto the white projections on the top of both cards and squeezing them together.**

2. Connect the RAM expansion card to the adapter. Make sure the ridge on the underside of the brace fits between the rows of chips on the RAM card. Position the expansion card brace over the RAM card and snap it into place.
3. Insert the two legs of the expansion card brace into the two brace slots in the logic board.

- ▲Caution**      **Be careful not to flex the RAM card or adapter when connecting the adapter to the logic board.**

4. Connect the adapter (with RAM card and brace attached) to connector J7 on the logic board.
5. Install the mounting screw.

- 
6. Verify that the upgrade is successful by checking the Total Memory message (for systems with virtual memory switched off) or the Built-in Memory message (for systems with virtual memory switched on). The memory size should be 4 MB of soldered RAM plus the RAM on the expansion board. If the memory size is incorrect, replace the RAM expansion card. If the memory size is still incorrect, send the computer to Apple.

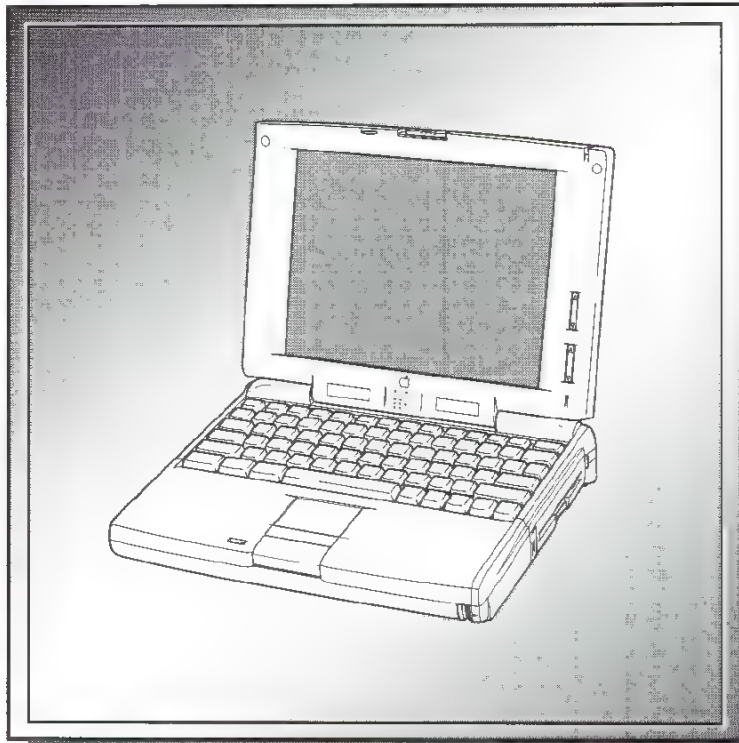
To disconnect the adapter from the logic board, be sure to use the Apple logic board take-apart tool.





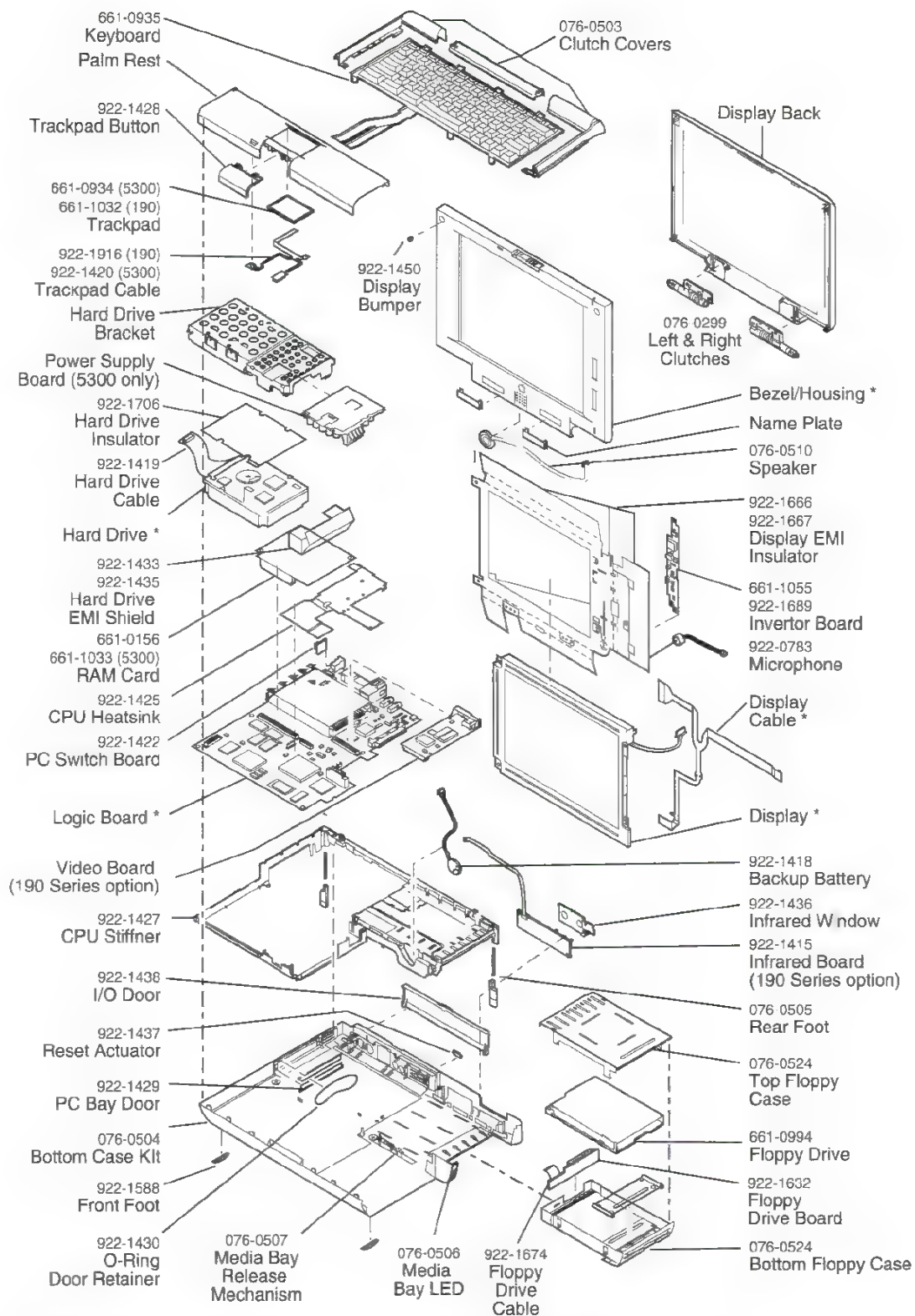
# Macintosh PowerBook 190

## Macintosh PowerBook 5300



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## Exploded View



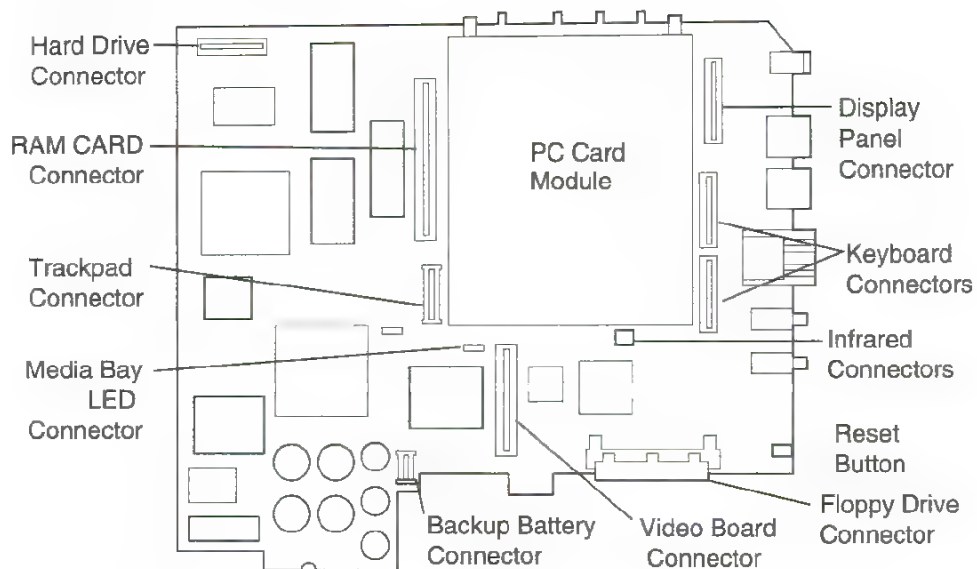
\* Multiple parts combinations. See parts lists for specific part configuration.

**This is a generic representation of a product family. Configurations may vary.**

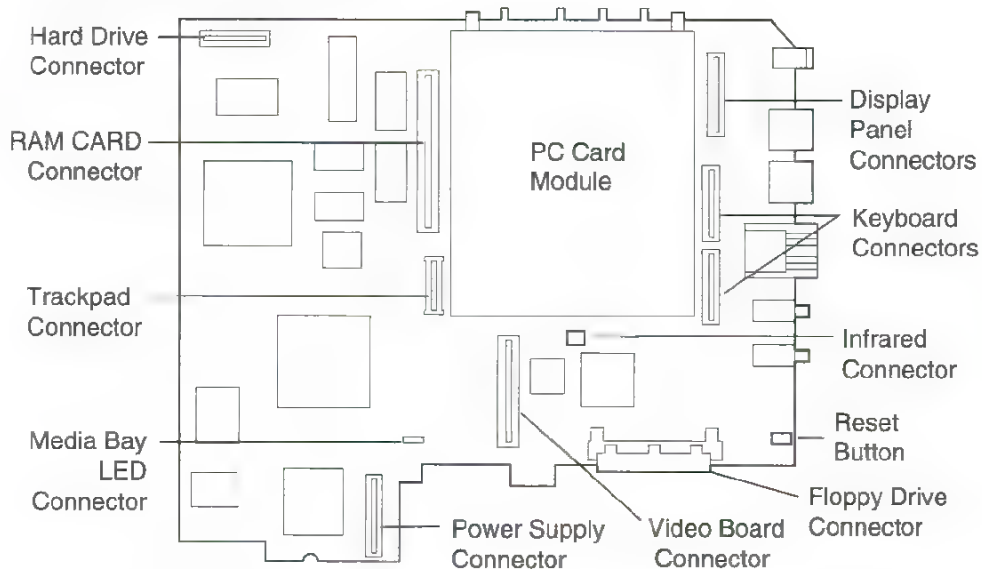
**Figure 60. PowerBook 190/5300 Exploded View**

## Logic Boards

### PowerBook 190 Logic Board



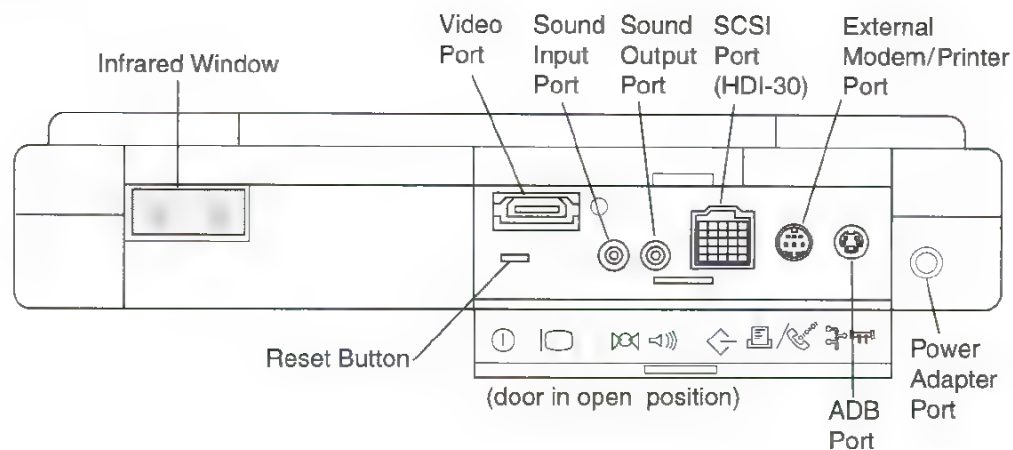
### PowerBook 5300 Logic Board



**Figure 61. PowerBook 190/5300 Logic Boards**

## Back Panel and Locator View

### Back Panel



### Locator

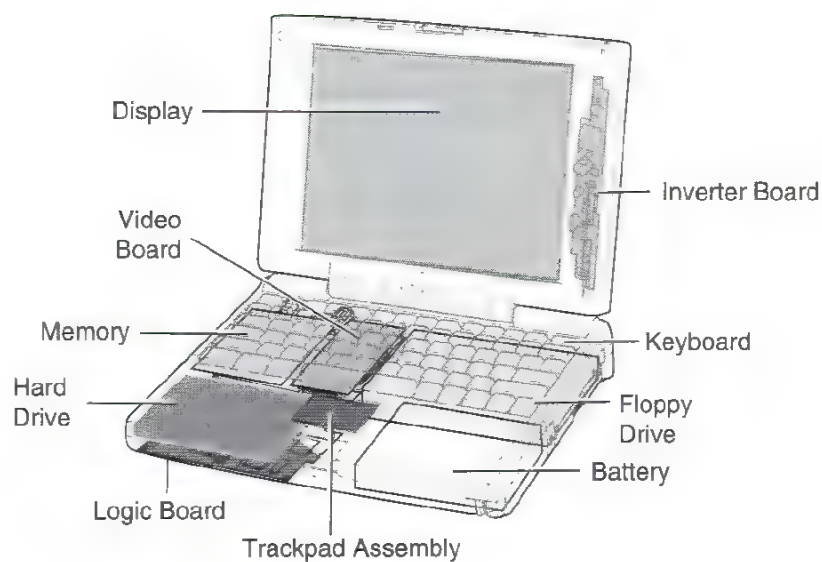


Figure 62. PowerBook 190/5300 Back Panel and Locator View



## Parts List

Actuator, Reset (Pkg. of 10) .....	922-1437
Actuator, Sleep (Pkg. of 10) .....	922-1424
Battery Cap (Pkg. of 5) .....	922-1685
Battery, Backup (Pkg. of 5) .....	922-1418
Battery, Lithium Ion .....	661-0939
Battery, Nickel-metal-hydride .....	661-1028
Bezel/Housing Kit, Color Display (190 Series) .....	076-0523
Bezel/Housing Kit, Color Display (5300 Series) .....	076-0512
Bezel/Housing Kit, Mono Display (190 Series) .....	076-0522
Bezel/Housing Kit, Mono Display (5300 Series) .....	076-0511
Board, Floppy Drive .....	922-1632
Board, Infrared .....	922-1415
Board, Inverter .....	922-1689
Board, Logic, 040, 33 MHz, 4 MB (190 Series) .....	661-0154
Board, Logic, 040, 33 MHz, 8 MB (190 Series) .....	661-1029
Board, Logic, 117 MHz, 16 MB, 1 MB, VGA (5300 Series) .....	661-0155
Board, Logic, 603e, 100 MHz, 16 MB, 1 MB, VGA (5300 Series) .....	661-0991
Board, Logic, 603e, 100 MHz, 16 MB, 512K (5300 Series) .....	661-0990
Board, Logic, 603e, 100 MHz, 8 MB, 512K (5300 Series) .....	661-0989
Board, Logic, 603e, 117 MHz, 16 MB, 1 MB, SVGA (5300 Series) .....	661-0992
Board, PC Switch, (PCMCIA) (Pkg. of 5) .....	922-1422
Board, Power Supply (5300 Series) .....	661-1056
Board, Video .....	661-1055
Board, Video, Spacer (Pkg. of 10) .....	922-1874
Bottom Case Kit .....	076-0504
Bracket, Hard Drive (Pkg. of 2) .....	922-1426
Bumper, Display (Pkg. of 10) .....	922-1450
Button, Trackpad (Pkg. of 10) .....	922-1428
Cable, Display, FSTN, Color, 10.4", Sanyo .....	922-1443
Cable, Display, FSTN, Color, 10.4", Sharp .....	922-1441
Cable, Display, FSTN, Greyscale, 9.5", Casio .....	922-1444
Cable, Display, FSTN, Greyscale, 9.5", Sharp .....	922-1619
Cable, Display, TFT, Color, 10.4", Hosiden (5300 Series) .....	922-1439
Cable, Display, TFT, Color, 10.4", Sharp (5300 Series) .....	922-1440
Cable, Display, TFT, Color, SVGA, 10.4", Toshiba (5300 Series) .....	922-1618
Cable, Display, TFT, Color, VGA, 10.4", Toshiba (5300 Series) ..	922-1617
Cable, Flex, Hard Drive .....	922-1419
Cable, Flex, Infrared .....	922-1421
Cable, Flex, Trackpad (190 Series) .....	922-1916
Cable, Flex, Trackpad (5300 Series) .....	922-1420
Cable, Floppy Drive (Pkg. of 10) .....	922-1674
Cable, Power, Domestic .....	922-1719
Card, RAM, 8 MB .....	661-0156

Card, RAM, 16 MB (5300 Series) .....	661-1033
Clutches, Left & Right.....	076-0299
Cover, Sound-In (Pkg. of 10) (190 Series) .....	922-1670
Cover, Video Expansion (Pkg. of 10) (190 Series) .....	922-1669
CPU Stiffener.....	922-1427
Display, FSTN, Color, 10.4" with Cable .....	661-0937
Display, FSTN, Greyscale, 9.5" with Cable .....	661-0938
Display, Insulator, EMI, 9.5" (Pkg. of 5) .....	922-1666
Display, Insulator, EMI, 10.4" (Pkg. of 5) .....	922-1667
Display, TFT, Color, 10.4" with Cable (5300 Series) .....	661-0936
Display, TFT, Color, SVGA, 10.4" with Cable (5300 Series) .....	661-1031
Display, TFT, Color, VGA, 10.4" with Cable (5300 Series) .....	661-1030
Door Retainer, O-Ring, (PCMCIA) (Pkg. of 10) .....	922-1430
Door, Input/Output (Pkg. of 10) .....	922-1438
Door, PC Card Bay, (PCMCIA) (Pkg. of 10) .....	922-1429
Facilitation Warranty Reimbursement, Per Repair .....	011-0083
Floppy Drive Case Kit.....	076-0524
Floppy Drive, 1.4 MB, Graphite .....	661-0994
Foot, Rubber (Pkg. of 10).....	922-1588
Foot/Spring Kit (Pkg. of 10) .....	076-0505
Hard Drive, 1.1 GB, 2.5", IDE (5300 Series) .....	661-0944
Hard Drive, 500 MB, 2.5", IDE (5300 Series) .....	661-0047
Hard Drive, 500 MB, 2.5", IDE (190 Series) .....	661-1058
Hard Drive, 750 MB, 2.5", IDE (5300 Series) .....	661-0957
Hard Drive Insulator (Pkg. of 5) .....	922-1706
Heat Sink, CPU (Pkg. of 10) .....	922-1425
Kapton Tape.....	922-1731
Keyboard, British .....	B661-0935
Keyboard, French .....	F661-0935
Keyboard, German .....	D661-0935
Keyboard, Japan.....	J661-0935
Keyboard, Spanish.....	E661-0935
Keyboard, Swedish .....	S661-0935
Keyboard, U.S. ....	661-0935
Label, FCC (Pkg. of 10) (190 Series).....	922-1665
Label, FCC (Pkg. of 10) (5300 Series).....	922-1668
Leaf Spring, Heat Sink (Pkg. of 10).....	922-1434
LED Kit, Media Bay .....	076-0506
Microphone (Pkg. of 5) .....	922-0783
Nameplate, Bezel (Pkg. of 10) .....	922-1431
Nameplate, Product ID, PB 190 (Pkg. of 10) .....	922-1663
Nameplate, Product ID, PB 190cs (Pkg. of 10) .....	922-1664
Nameplate, Product ID, PB 5300 (Pkg. of 10) .....	922-1448

Nameplate, Product ID, PB 5300c (Pkg. of 10) .....	922-1446
Nameplate, Product ID, PB 5300ce (Pkg. of 10) .....	922-1892
Nameplate, Product ID, PB 5300cs (Pkg. of 10) .....	922-1447
PC Card Drawer (PCMCIA) .....	922-1432
Power Adapter .....	922-1417
Power Supply Insulator (Pkg. of 5) (5300 Series) .....	922-1704
Release Mechanism Kit, Media Bay .....	076-0507
Screw Kit .....	076-0508
Shield, EMI, Hard Drive (Pkg. of 5) ..	922-1435
Shield, EMI, Input/Output (Pkg. of 10) .....	922-1433
Shield, EMI, Power Supply Board (Pkg. of 5) .....	922-2247
Speaker Kit .....	076-0510
Top Case Kit .....	076-0503
Trackpad (190 Series) .....	661-1032
Trackpad (5300 Series) .....	661-0934
Window, Infrared (Pkg. of 10) .....	922-1436

## Specifications

**Table 11. Macintosh PowerBook 190 and 5300 Specifications**

<b>Processor</b>	<p>PowerBook 190 Series: Motorola 68LC040 microprocessor running at 33 MHz</p> <p>PowerBook 5300 Series: PowerPC 603e RISC microprocessor running at 100 MHz (5300/100, 5300c/100, 5300cs/100) or 117 MHz (5300/17)</p> <p>All Systems: Require system software version 7.5.2 or later with PowerBook System Enabler 5300/2300/190 version 1.2.1</p> <p>Addressing: 32-bit internal registers, address bus and data bus.</p>
<b>Memory</b>	<p>RAM installed on the logic board: 4–8 MB on the 190/66 and 190cs/66; 8 MB on the 5300/100; 8–16 on the 5300c/100 and 5300cs/100; 32 MB on the 5300ce/117. Expandable to 64 MB with third-party RAM expansion card</p> <p>ROM: 2–4 MB soldered on the logic board</p> <p>PRAM: 256 bytes of parameter memory</p> <p>VRAM: 512K for passive display configurations; 512K and 1 MB for active display configurations on the logic board; 512K on the video board. Video board expandable to 1 MB</p>
<b>Disk Storage</b>	<p>Floppy Drive: 15 mm high, internal, 1.4 MB Apple SuperDrive</p> <p>Hard Drive: 2.5", IDE, 500 MB, 750 MB, and 1.1 GB capacities</p>
<b>I/O Interfaces</b>	<p>SCSI: HDI-30 SCSI port with 1.5 MB/sec transfer rate. Supports up to six external SCSI devices. Connect SCSI device to computer with HDI-30 SCSI system cable</p> <p>Apple Desktop Bus: Apple Desktop Bus (ADB) port; 200 mA maximum current draw for all ADB devices</p> <p>Serial: RS-422 serial port; mini DIN-8 connector</p> <p>Sound: Stereo line-in port; Stereo sound-out headphone jack; standard 3.5 mm stereo miniplugs</p> <p>Video: Micro DV-14 video-out port; 8 bit, 256 color video output (optional on PowerBook 190). Supports most Macintosh monitors, VGA monitors, and SVGA monitors</p> <p>PC Card Slots: Allow use of either two Type I and Type II cards, or one Type III card</p> <p>Infrared: Supports LocalTalk</p> <p>Power Adapter: Power adapter port</p>
<b>I/O Devices</b>	<p>Keyboard: Built-in keyboard with 12 function keys, 76 keys domestic, 77 keys ISO. Two-level tilt adjustment (extending-computer feet)</p> <p>Trackpad: Solid state trackpad</p> <p>Microphone: Electret, omnidirectional; Output voltage of 4 mV, peak to peak</p>
<b>Sound</b>	<p>Apple sound chip provides 16-bit sound capable of driving stereo headphones or other stereo equipment through the sound jack</p>



**Table 11. Macintosh PowerBook 190 and 5300 Specifications  
(Continued)**

<b>Sound</b>	Apple sound chip provides 16-bit sound capable of driving stereo headphones or other stereo equipment through the sound jack
<b>Video</b>	<p>PowerBook 190/66 and 5300/100: 9.5-in. (24 cm) diagonal screen. Backlit, FSTN greyscale display; 16 levels; 640x480 pixels</p> <p>PowerBook 190cs/66 and 5300cs/100: 10.4-in. (26 cm) diagonal screen. Backlit, FSTN color display 256 colors; 640x480 pixels</p> <p>PowerBook 5300c/100: 10.4-in (26 cm) diagonal screen. Backlit, TFT active matrix color display; 512K of VRAM supports 256 colors; 1 MB VRAM supports thousands of colors; 640x480 pixels</p> <p>PowerBook 5300ce/117: 10.4-in. (26 cm) diagonal screen. Backlit, TFT/SVGA color display, thousands of colors, 800x600 pixels</p>
<b>Electrical</b>	<p>Main Battery: One nickel-metal-hydride (NiMH) battery. Up to 2.5–4 hours of use before recharging. Recharge time: 2 hours in shutdown or sleep mode, 4 hours while computer is running</p> <p>Power Adapter: 100–240 VAC line voltage. 45 W, 50–60 Hz</p>
<b>Physical</b>	<p>Height: 2.0 in (5.1 cm) monochrome displays 2.2 in (5.6 cm) color displays</p> <p>Width: 11.5 in (29.2 cm)</p> <p>Depth: 8.5 in. (21.6 cm)</p> <p>Weight: 5.9 lb (2.7 kg) 5300/100 6.0 lb (2.7 kg) 190/66 6.2 lb (2.8 kg) 5300c/100, 5300cs/100, 5300ce/117 6.3 lb (2.9 kg) 190cs/66</p>
<b>Environmental</b>	<p>Operating Temperature: 41°–95° F (5°–35° C)</p> <p>Storage Temperature: 14°–140° F (-10°–60° C) Nickel-metal-hydride; -13°–140° F (-25°–60° C) Lithium-ion</p> <p>Relative Humidity: 20%–80% noncondensing</p> <p>Operating Altitude: 0–10,000 ft. (0–3,048 m)</p> <p>Maximum Storage Altitude: 15,000 ft (4,722 m)</p>
<b>Miscellaneous</b>	<p>Clock/Calendar: CMOS custom chip with long-life lithium battery</p> <p>Security: Slot for third-party security equipment. Password protection software</p>



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## Troubleshooting Procedures

---

### Resetting the Power Manager

If a unit crashes or experiences power problems, reset the power manager chip by pressing the rear power switch for 30-45 seconds.

If resetting the power manager chip does not solve the problem, reset the code for the power manager chip by removing all power sources and letting the unit sit for 10 minutes. (Take out the battery and disconnect the AC adapter and the internal backup battery.) This forces the PowerBook to reload the power manager code from the system software.

---

### Resetting the Parameter RAM (PRAM)

To reset or zap the PRAM, restart the computer while holding down the Command-Option-P-R keys.

## Symptom/Cure Chart

This Symptom/Cure Chart will help you diagnose specific symptoms related to your product. Because the most likely solution is listed first, try the first-listed solution. Verify whether or not the product continues to exhibit the symptom. If the symptom persists, try the next solution. (Note: If you have replaced a module, reinstall the original module before you proceed to the next solution.)

For additional assistance, contact Apple Technical Support.

### Startup

### Solutions

RAM failure occurs (eight-tone error chord sequence sounds after startup chord)

- 1 Remove RAM card (if present) and restart computer. If startup sequence is normal, replace RAM card and retest.
- 2 Reseat RAM card and check connection.
- 3 Replace RAM card.
- 4 Replace logic board.

Hardware failure occurs (four-tone error chord sequence sounds after startup chord)

- 1 Reset PRAM (see Resetting the Parameter RAM in "Troubleshooting Procedures.")
- 2 Remove floppy drive from media bay and restart computer. If startup sequence is normal, insert floppy drive and retest.
- 3 Replace floppy drive mechanism.
- 4 Disconnect hard drive cable and restart computer. If startup sequence is normal, reconnect cable and retest.
- 5 Replace hard drive.
- 6 Replace logic board.

Startup failure occurs when using minimum System Folder and System 7.5.2.

Upgrade to System Enabler 1.2.1 or later. Refer to Apple Software Updates on Service Source Companion CD or Service Source Online (<http://service.info.apple.com>).

## Power<sup>1</sup>

## Solutions

Computer won't power up

- 1 If sleep LED is continually on, backup battery power has been interrupted. Restart computer by holding down reset actuator 10–20 seconds. If computer doesn't restart, repeat 3–4 times.
- 2 Try known-good power adapter. Verify power adapter tip is not chipped or cracked.
- 3 Try known-good, charged battery.
- 4 Reset power manager (see Resetting the Power Manager in "Troubleshooting Procedures").
- 5 Connect power adapter and restart computer in 3–4 minutes.
- 6 Replace power supply board (5300 Series only).
- 7 Replace logic board.

Screen is blank; computer doesn't respond

- 1 If sleep LED is continually on, backup battery power has been interrupted. Restart computer by holding down reset actuator 10–20 seconds. If computer doesn't restart, repeat 3–4 times.
- 2 Restart computer.
- 3 Disconnect power adapter, remove battery, and restart computer in 3–4 minutes.
- 4 Check power adapter cord.
- 5 Try known-good, charged battery.
- 6 Try known-good power adapter. Verify power adapter tip is not chipped or cracked.
- 7 Reset power manager (see Resetting the Power Manager in "Troubleshooting Procedures").
- 8 Check all logic board cables and connections.
- 9 Replace keyboard.
- 10 Replace power supply board (5300 Series only).
- 11 Replace logic board.

After you remove battery, some Control Panel settings are different

- 1 Check keyboard and backup battery cables and connections.
- 2 Replace backup battery.
- 3 Replace logic board.

Sleep light is blinking but computer is not in sleep mode.

Reset the power manager (see Resetting the Power Manager in "Troubleshooting Procedures").

---

1. In the 5300 Series computers, you will hear only the click of the power-on button when you attempt to start up a computer that lacks sufficient power to start.

Computer runs when plugged into wall outlet but not on battery power; battery voltage is within tolerance

- 1 Reset power manager (see Resetting the Power Manager in "Troubleshooting Procedures").
- 2 Reseat battery to make sure battery is mating with contacts on logic board.
- 3 Try known-good battery.
- 4 Try known-good power adapter.
- 5 Replace power supply board (5300 Series only).
- 6 Replace logic board.

Power adapter is plugged in, but Control Strip doesn't indicate adapter is connected

- 1 Verify that power adapter is connected correctly.
- 2 Try known-good power adapter.
- 3 Replace logic board.

When Shutdown is selected with power adapter plugged in, computer shuts down but immediately powers back up

- 1 Reset PRAM (see Resetting the Parameter RAM in "Troubleshooting Procedures").
- 2 Disconnect power adapter, remove battery, disconnect backup battery, and wait 15 minutes before retesting.

Low-power warning appears

- 1 Attach power adapter and recharge battery.
- 2 Disconnect peripherals. If warning disappears when peripherals are disconnected, verify that peripherals are low-power.
- 3 Reduce use of floppy or hard drive, sound, backlight, or other power-consuming devices, or connect power adapter.
- 4 Try known-good, charged battery.
- 5 Try known-good power adapter.
- 6 Replace power supply board (5300 Series only).
- 7 Replace logic board.

## Video<sup>2</sup>

Partial or full row of pixels is always on or never comes on in an active matrix display

### Solutions

- 1 Check display and backlight cables and connections.
- 2 Replace display.
- 3 Replace logic board.

---

2. A certain number of defects is inherent in display technology. If you suspect that your display contains an abnormal number of defects, call Apple Technical Support.

Display is very light or totally white	1	Adjust screen contrast and brightness settings.
	2	Verify cable, inverter board, and logic board connections.
	3	Replace inverter board.
	4	Replace display.
	5	Replace logic board.
Display stopped working or dimmed but is fine now	1	PowerBook 190 Series, 5300/100, 5300cs/100: If temperature is under 0° C or over 50° C, this reaction is normal. Let screen warm up for 30 minutes. If symptom persists, replace display.
	2	PowerBook 5300c/100 and 5300ce/117: replace display
Backlight doesn't operate	1	Adjust screen contrast and brightness settings.
	2	Verify that backlight cable connection is secure.
	3	Check cable, inverter board, and logic board connections.
	4	Verify that cables are not pinched or severed.
	5	Replace inverter board.
No display, but computer appears to operate correctly	6	Replace display.
	7	Replace logic board.
	1	Insert a disk into the floppy drive and press Command-E (to eject a disk) to verify that computer is working.
	2	Adjust screen contrast and brightness settings.
	3	Verify display cable, inverter board, trackpad, keyboard, and logic board connections.
	4	Connect power adapter.
	5	Replace inverter board.
Thin white line is always on at middle of screen	6	Replace display.
	7	Replace logic board.
	1	PowerBook 190 Series, 5300/100, 5300cs/100: thin white line is normal.
	2	PowerBook 5300c/100 and 5300ce/117: change the desktop pattern; if the line remains, replace display.
	1	Verify cable and cable connections between monitor and video board.
	2	Reseat video board and retest.
	3	Replace video board.



An external monitor connected to the PowerBook shows either horizontal or vertical rolling, or horizontal or vertical distortion

- 1 Verify monitor using another computer.
- 2 Replace video board.

## Sound

No sound from speaker

## Solutions

- 1 Verify that volume setting in Control Panel is above 0.
- 2 Verify that no external speaker is plugged in.
- 3 Check display cable connections.
- 4 Check inverter board connections.
- 5 Replace display cable.
- 6 Replace inverter board.
- 7 Replace speaker.
- 8 Replace logic board.

## Floppy Drive<sup>3</sup>

Audio and video present, but floppy drive in media bay does not operate

## Solutions

- 1 Try known-good floppy disk.
- 2 Check floppy drive cable connection.
- 3 Replace floppy drive cable.
- 4 Replace floppy drive.
- 5 Replace logic board.

Disk ejects while booting; display shows Mac icon with blinking X

- 1 Try known-good system disk.
- 2 Verify that floppy disk is not locked.
- 3 Verify that trackpad and trackpad button are working.
- 4 Verify that keyboard is working.
- 5 Check floppy drive cable connection.
- 6 Replace floppy drive cable.
- 7 Replace floppy drive.
- 8 Replace logic board.

3. The floppy drive cable referred to in this section is the cable **inside** the floppy drive case.

---

Disk does not eject

- 1 Switch off system and hold trackpad button down while you switch system on.
- 2 Eject disk manually by carefully inserting opened paper clip into hole near floppy drive slot.
- 3 Check floppy drive cable connection.
- 4 Replace floppy drive cable.
- 5 Replace floppy drive.
- 6 Replace logic board.

Disk initialization fails

- 1 Try known-good floppy disk.
- 2 Check floppy drive cable connection.
- 3 Replace floppy drive cable.
- 4 Replace floppy drive.
- 5 Replace logic board.

Read/write/copy error

- 1 Try known-good floppy disk.
- 2 Check floppy drive cable connection.
- 3 Try to format a floppy disk.
- 4 Replace floppy drive cable.
- 5 Replace floppy drive.
- 6 Replace logic board.

## **Hard Drive**

Internal hard drive does not spin up

### **Solutions**

- 1 Make sure power adapter is connected.
- 2 Disconnect external SCSI devices.
- 3 Check hard drive cable connection.
- 4 Replace hard drive cable.
- 5 Use Hard Drive Format to reinitialize drive.
- 6 Replace hard drive.
- 7 Replace logic board.

## **PCMCIA Card**

PC Card won't eject

### **Solutions**

- 1 Make sure PC Card slot is not blocked.
- 2 Insert straightened paper clip into hole next to slot.
- 3 Verify that PC Card is not warped or damaged in any way.
- 4 Replace logic board.

PC Card is inserted but doesn't appear on desktop<sup>4</sup>

- 1 Try PC Card in the other slot.
- 2 Replace PC Card.
- 3 Replace logic board.

"Defective card" or "Unrecognizable card" appears in place of card name in PCMCIA Eject control panel.

- 1 Eject card and inspect for damage.
- 2 Reinstall software required to support card.
- 3 Replace card with a known-good card.

System with PC card performs poorly or hangs during floppy drive operations

Replace logic board.

### Infrared

Infrared communication is not working

### Solutions

- 1 Clean infrared window with soft lint-free cloth.
- 2 In 190 Series, verify that an infrared board is present by removing keyboard and looking for the white infrared flex cable routed on top of media bay and video card (if present).
- 3 Verify infrared cable connection.
- 4 Verify infrared signal is being received by host computer.
- 5 Replace infrared cable.
- 6 Replace infrared board.

### Peripherals

After you connect external SCSI device, computer does not boot

### Solutions

- 1 Verify that device and SCSI chain are terminated correctly.
- 2 Switch on external SCSI device before starting computer.
- 3 Check cable connections.
- 4 Try known-good SCSI cable.
- 5 Verify that SCSI ID select switch setting on external device is unique.
- 6 Try known-good external SCSI device.
- 7 Replace logic board.

4. Modem and communication cards may not appear on desktop.

---

Cursor does not move when you are using trackpad<sup>5</sup>

- 1 Shut down computer, unplug adapter, and remove battery. Let computer sit for 1 minute before restarting.
- 2 Reset power manager (see Resetting the Power Manager in "Troubleshooting Procedures").
- 3 Check trackpad connections.
- 4 Check keyboard and logic board connections.
- 5 Connect low-power mouse and try to move cursor. If cursor moves, try using trackpad and keyboard. If trackpad does not move cursor, replace trackpad. If keyboard does not respond, replace keyboard.
- 6 Replace logic board.

Cursor intermittently does not move or moves erratically

- 1 Clean trackpad surface (with computer off, using a nonstatic inducing material).
- 2 Check trackpad connections.
- 3 Replace trackpad.
- 4 Replace keyboard.
- 5 Replace logic board.

Cursor moves, but clicking trackpad button has no effect

- 1 Reset power manager (see Resetting the Power Manager in "Troubleshooting Procedures").
- 2 Check trackpad connections.
- 3 Check keyboard and logic board connections.
- 4 Replace trackpad cable.
- 5 Replace trackpad.
- 6 Replace keyboard.
- 7 Replace logic board.

Cursor does not move when you are using mouse

- 1 Check mouse connection to ADB port.
- 2 Try a known-good low-power mouse. If the known-good mouse works, clean mouse ball and inside of original mouse and retest. If the original mouse still doesn't work, replace it.
- 3 Replace logic board.

---

5. User must touch trackpad with only one finger at a time and must press down directly on the trackpad surface.

No response to any key on keyboard

- 1 Verify that computer is on.
- 2 Reset the power manager (see Resetting the Power Manager in "Troubleshooting Procedures").
- 3 Check keyboard connection by disconnecting and reconnecting keyboard cables.
- 4 Replace keyboard.
- 5 Replace logic board.

Known-good direct-connect printer does not print

- 1 Reset PRAM (see Resetting the Parameter RAM in "Troubleshooting Procedures").
- 2 Verify that Chooser and Control Panel settings are correct and that AppleTalk is off.
- 3 Select 'modem port' in Control Panels window.
- 4 Check cables.
- 5 Replace printer cable.
- 6 Try known-good printer.
- 7 Replace logic board.

Known-good network printer does not print

- 1 Reset PRAM (see Resetting the Parameter RAM in "Troubleshooting Procedures").
- 2 Verify that Chooser and Control Panel settings are correct and that AppleTalk is on.
- 3 Check cables.
- 4 Attach computer directly to printer, and retest.
- 5 Replace logic board.

I/O devices are unrecognized, or garbage is transmitted or received

- 1 Reset PRAM (see Resetting the Parameter RAM in "Troubleshooting Procedures").
- 2 Check cables.
- 3 Verify that SCSI device is correctly terminated.
- 4 Verify that SCSI select switch setting on external device is unique.
- 5 Test device with known-good computer.
- 6 Replace logic board.

In disk mode, computer does not display SCSI icon until host is booted, or computer crashes when host is shut down

- 1 Verify that computer has a unique SCSI ID.
- 2 Check that SCSI disk mode cable is good and that connection is tight.
- 3 Replace logic board.



---

## Miscellaneous

## Solutions

Sleep light won't come on

- 1 Verify that computer is in sleep mode and not powered off.
- 2 Reset power manager (see Resetting the Power Manager at the beginning of this section).
- 3 Replace inverter.

Screen goes blank and computer shuts down every few minutes

Computer is going into system sleep to conserve battery power. Adjust sleep delays in Control Panel or connect power adapter.

Application seems to run slower after a few seconds

Computer is switching to system rest. If system rest is interfering with operation of application, connect power adapter.

Hard drive is slow to respond, or screen goes blank too often

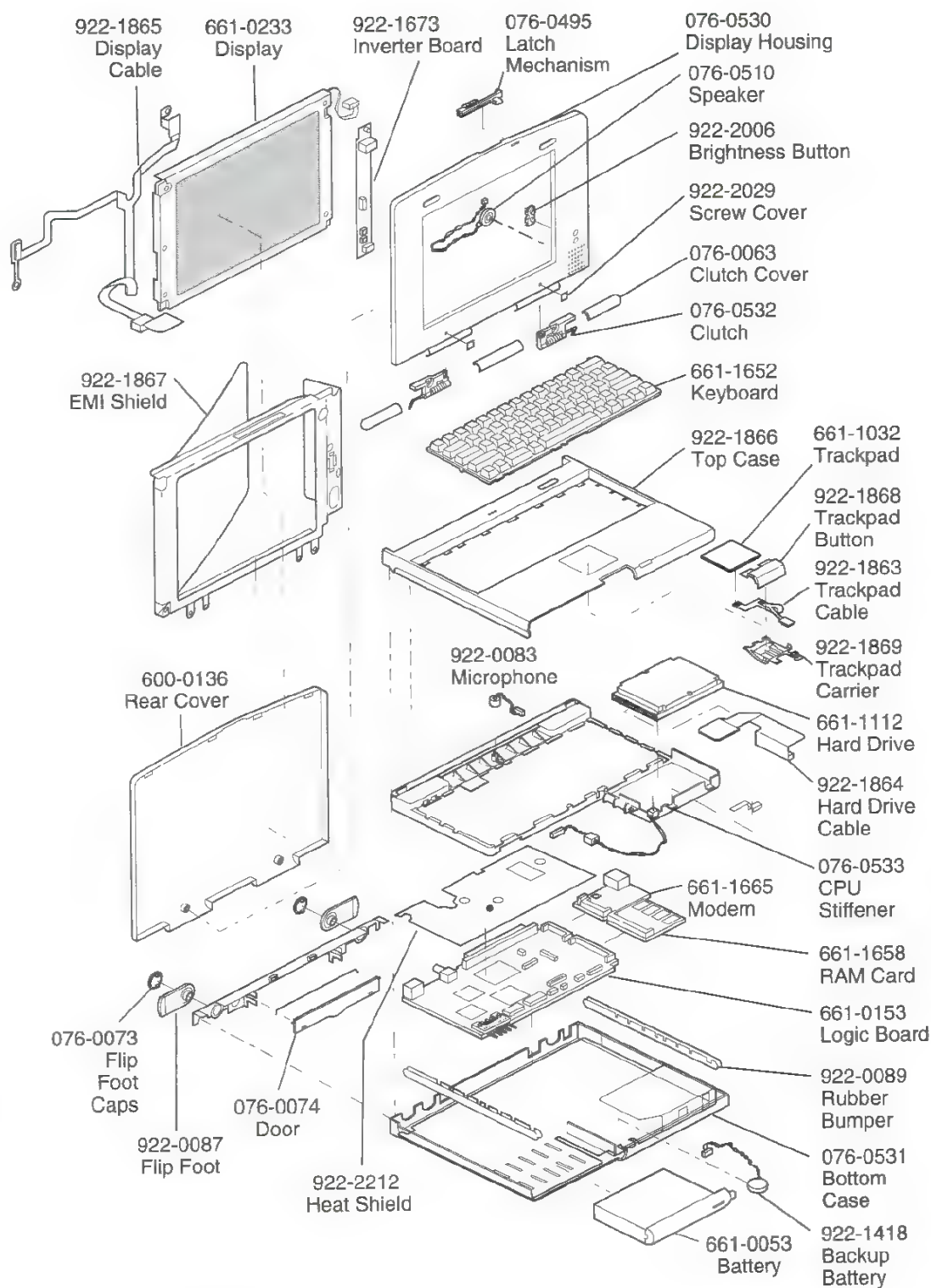
- 1 Ensure the power supply EMI shield is installed.
- 2 Adjust sleep delays in control panel or connect power adapter.

# Macintosh PowerBook Duo 2300



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## Exploded View



**Figure 63. PowerBook Duo 2300 Exploded View**

## Logic and Other Boards

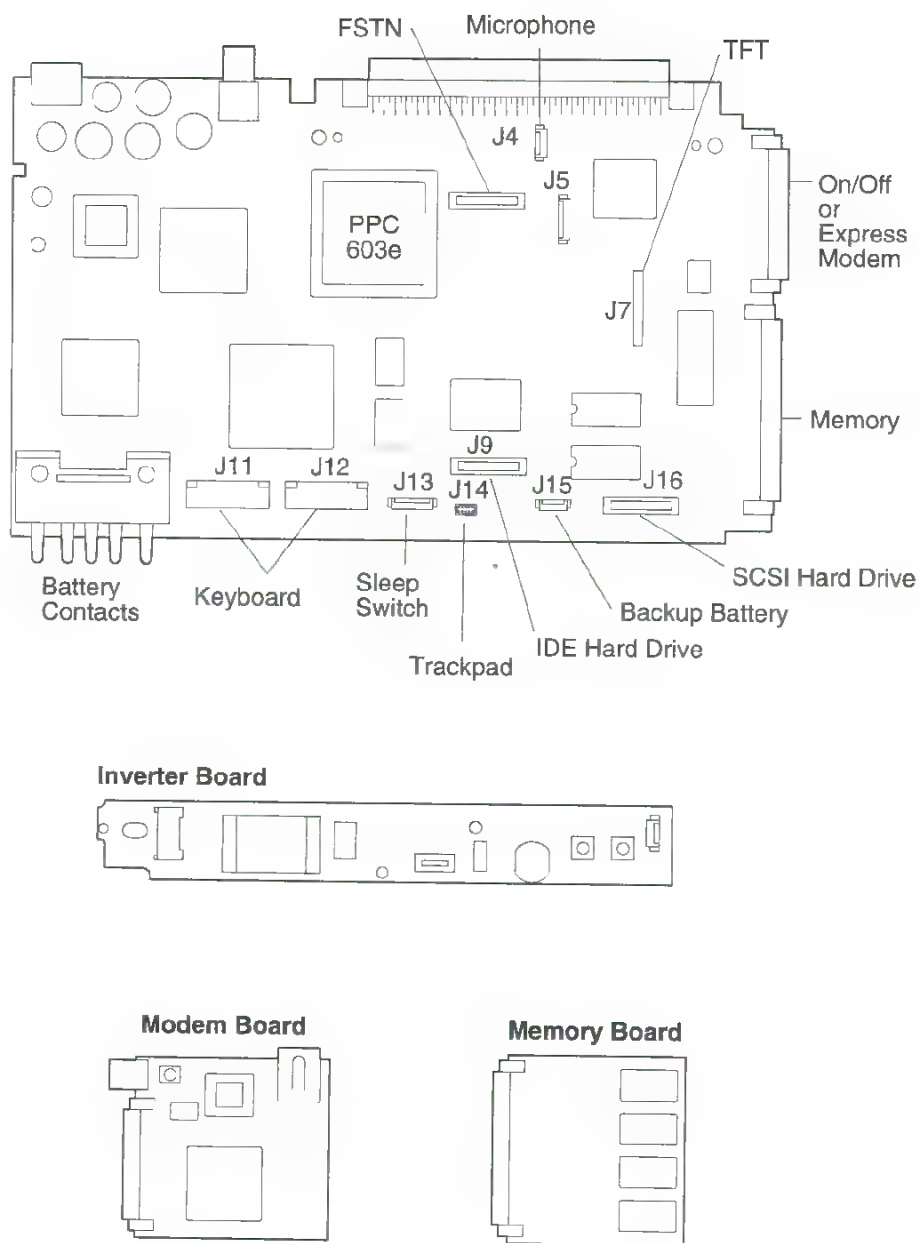
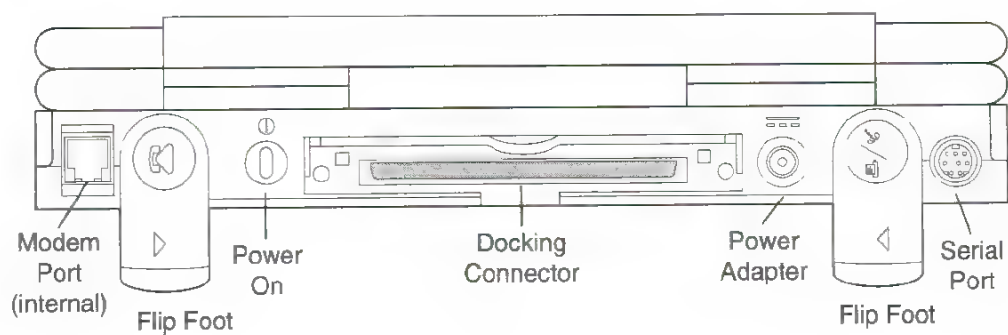


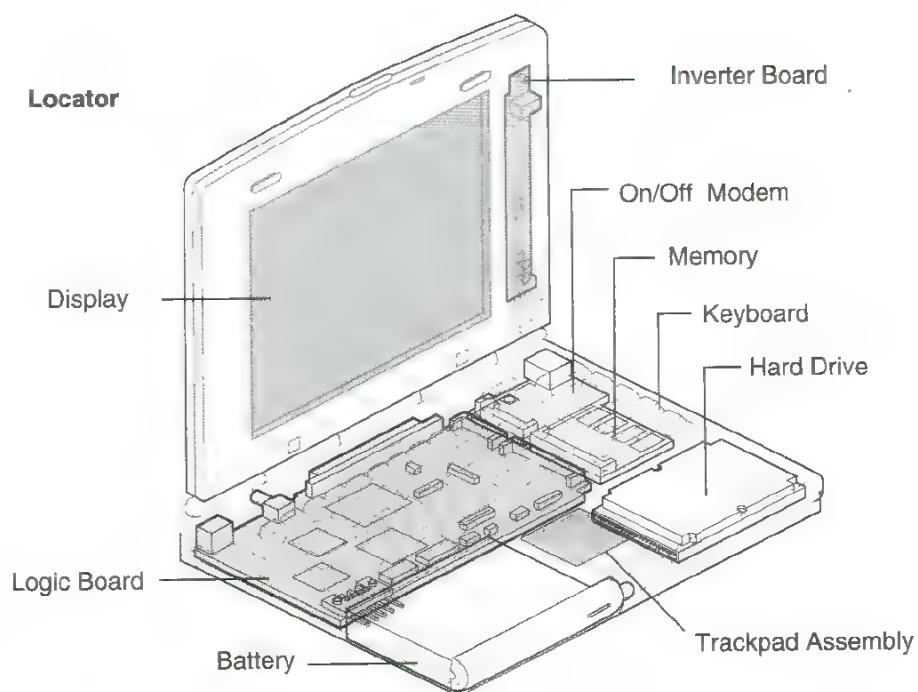
Figure 64. PowerBook Duo 2300 Logic and Other Boards

## Back Panel and Locator View

### Back Panel



### Locator



**Figure 65. PowerBook Duo 2300 Back Panel and Locator View**



## Parts List

Adapter, Floppy .....	661-1663
Adapter, Power, 36 W .....	922-1202
Battery, Backup (Pkg. of 5) .....	922-1418
Battery Case, Type 1/2/3 .....	922-0086
Battery Door, Type 2/3, .....	922-0435
Battery Recharger, Type 1/2/3, PB .....	922-0576
Battery with Door, Type 3 .....	661-0053
Board, Inverter, CPRC/Int'l .....	922-1673
Board, Logic, 603e, 100 MHz .....	661-0153
Board, On/Off .....	922-0096
Bumper, Rubber (Pkg. of 2) .....	922-0089
Cable, Display, CPRC/Int'l .....	922-1865
Cable, Hard Drive, IDE .....	922-1864
Cable, Power, Domestic .....	922-1719
Cable, Power, External AC .....	922-0054
Cable, Trackpad .....	922-1863
Card, RAM, 12 MB .....	661-1067
Card, RAM, 8 MB .....	661-1658
Case, Bottom, with labels .....	076-0531
Case, Top .....	922-1866
Clutch Cover Kit .....	076-0063
Clutch Kit, Display, L&R, CPRC/Int'l .....	076-0532
Clutch Retainer Clip (Pkg. of 2) .....	922-0090
Cover, Rear, PB Duo .....	600-0136
Cover, Screw, Display (Pkg. of 100) .....	922-2029
CPU Stiffener .....	076-0533
Display, Active Matrix, Color, CPRC/Int'l .....	661-0233
Display, Actuator, .....	922-0093
Display, Brightness Button, CPRC/Int'l (Pkg. of 10) .....	922-2006
Door, I/O with Link .....	076-0074
Foot, Flip, Caps, Kit .....	076-0073
Foot, Flip, Left .....	922-0087
Foot, Flip, Right .....	922-0088
Hard Drive, 1.1 GB, 2.5", IDE .....	661-0944
Hard Drive, 750 MB, 2.5", IDE .....	661-1112
Hard Drive Bracket, 2.5 (Pkg. of 2) .....	922-0705
Heatsink, Logic Board .....	922-1870
Housing Kit, Display, CPRC/Int'l .....	076-0530
Keyboard, British .....	B661-1652
Keyboard, Domestic .....	661 1652
Keyboard, French Canadian .....	C661-1652
Keyboard, French .....	F661-1652
Keyboard, German .....	D661-1652

Keyboard, Japanese .....	J661-1652
Keyboard, Spanish .....	E661-1652
Keyboard, Swedish .....	S661-1652
Latch Mechanism Kit, CPROC/Int'l .....	.076-0495
Microphone, Internal .....	922-0083
Modem, Cap. ....	922-0080
Modem, Express, 14.4 Baud, U.S. ....	.661-1665
Modem, Express, 14.4 Baud, Int'l .....	.661-1662
Screw Kit .....	.076-0072
Screw Kit, Cover, Display .....	.076-0486
Screw, Hard Drive .....	922-1275
Screw, Tap, Torx, K22x.98Px5.5 (Pkg. of 10) .....	922-1871
Screw, Tap, Torx, M2.2x.98Px8MM (Pkg. of 10) .....	922-1873
Shield, EMI, Display, CPROC/Int'l (Pkg. of 5) .....	922-1867
Shield, EMI, Trackpad (Pkg. of 10) .....	922-1890
Speaker Kit, CPROC/Int'l .....	.076-0510
Tape, Kapton .....	922-1731
Tape, Kapton .....	922-1731
Trackpad .....	.661-1032
Trackpad Button (Pkg. of 10) .....	922-1868
Trackpad Carrier (Pkg. of 10) .....	922-1869

## Specifications

<b>Table 12. Macintosh PowerBook Duo 2300 Specifications</b>	
<b>Processor</b>	CPU: PowerPC 603e RISC processor; 100 MHz Addressing: 32-bit data bus
<b>Memory</b>	RAM: 8 MB of low-power, self-refresh dynamic RAM on board; expandable to 56 MB. Maximum of 48 MB RAM expansion card, with 70 ns or faster chips. Note: The PowerBook Duo 2300 is compatible with older PowerBook Duo RAM cards with 85 ns chips. ROM: 1 MB of ROM on board Clock/Calendar: CMOS custom chip with long-life rechargeable lithium battery
<b>Disk Storage</b>	Hard Drive: Internal 2.5" IDE drive (750 MB or 1.1 GB) Floppy Drive: Optional external 1.4 MB Apple SuperDrive
<b>I/O Interfaces</b>	Processor-Direct Slot: 152 pin processor-direct slot (PDS) con- nector for attaching expansion devices; 32-bit expansion bus Serial: Serial port for attaching modem, printer, AppleTalk net- work, or other serial device (RS-422 or mini DIN-8) Modem: Modem telephone jack (RJ-11 in United States, mini DIN-8 elsewhere) for optional internal modem Power Adapter: Power adapter port
<b>I/O Devices</b>	Keyboard: Built-in standard Apple keyboard; 63 keys, domestic; 64 keys, ISO Caps-locked LED; Soft power-on switch; 2.4 mm travel; 18 mm vertical and horizontal pitch; Two-level tilt adjustment using feet Trackpad: Solid-state trackpad; 400 dpi resolution for relative mode; 520 dpi minimum resolution for absolute mode
<b>Sound and Video</b>	Sound Generator: 4-voice sound with 16-bit digital-analog conversion; records at 44 kHz sample rate Microphone: built-in, omnidirectional Electret Speaker: built-in Video Display: 9.5" active-matrix color display, 640 by 480 pixels with 256 colors, or 640 by 400 pixels with thousands of colors

**Table 12. Macintosh PowerBook Duo 2300 Specifications  
(Continued)**

<b>Electrical</b>	<p>Main Battery: NiMH (nickel metal hydride), Type 3; 2-4 hours of use before recharging. Recharge time: approximately 2 hours if in sleep or shutdown mode; approximately 4 hours when computer is in use.</p> <p>Power Adapter: Input: AC 100-240 V, 50-60 Hz. Output: DC 24 V, 1.5 A, 36 W.</p> <p>Microphone: Output: 4 mV peak to peak at normal speaking volume.</p> <p>Apple Desktop Bus (ADB): Maximum current draw: 100 mA (PowerBook Duo MiniDock or PowerBook Floppy Adapter) or 500 mA (PowerBook Duo Dock).</p>
<b>Physical</b>	<p>Height: 1.5 in. (3.8 cm) Width: 10.9 in. (27.7 cm) Depth: 8.5 in. (21.6 cm) Weight: 4.8 lb. (2.2 kg)</p>
<b>Environmental</b>	<p>Operating Temperature: 41–95° F (5–35° C) if used alone or connected to a MiniDock or floppy disk adapter 41–86° F (5–30° C) if used in a Duo Dock Plus or other Duo Dock</p> <p>Storage Temperature: -13°–140° F (-25°–60° C)</p> <p>Relative Humidity: 20%–80% noncondensing</p> <p>Operating Altitude: 0–10,000 ft. (0–3,048 m) maximum</p> <p>Storage Altitude: 0–15,000 ft. (0–4,572 m) maximum</p>
<b>Other</b>	<p>Express Modem: 14,400-bps data transmission, with 14,400-bps fax send and receive capability. Supports two error-correction and data-compression protocols: MNP classes 2 to 5 and CCITT standard V.42/V.42bis.</p> <p>SCSI Adapter: Enables connection between PowerBook computer and desktop Macintosh (PowerBook appears as a hard drive on the desktop).</p>

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## Troubleshooting Procedures

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### Battery Contact Alignment

Use the Duo battery contact alignment tool in these situations:

- Any time a battery contact screw is loosened, removed, or replaced.
- Whenever a PowerBook Duo logic board is installed or reassembled into a system.
- Whenever a PowerBook Duo with a known good battery shuts down unexpectedly (other than going to sleep), won't boot off the battery, or intermittently powers off when running off the battery.
- Any time a known good PowerBook Duo battery won't charge.

---

### Resetting the Power Manager

If a unit crashes or experiences power problems, reset the power manager chip by pressing the rear power switch for 30-45 seconds.

If resetting the power manager chip does not solve the problem, reset the code for the power manager chip by removing all power sources and letting the unit sit for 10 minutes. (Take out the battery and disconnect the AC adapter and the internal backup battery.) This forces the PowerBook Duo to reload the power manager code from the system software.

---

### Logic Board Replacement Reminders

When replacing the logic board:

- Check that the serial port EMI clip is attached to the bottom of the CPU stiffener. If it is missing, replace the stiffener. Refer to Hardware/Portable Computers/PowerBook Duo 2300/Take Apart/CPU Stiffeners on *Service Source CD* for more information.
- Perform the battery contact alignment procedure when you replace a logic board.



---

## Symptom/Cure Chart

This Symptom/Cure Chart will help you diagnose specific symptoms related to your product. Because the most likely solution is listed first, try the first-listed solution. Verify whether or not the product continues to exhibit the symptom. If the symptom persists, try the next solution. (Note: If you have replaced a module, reinstall the original module before you proceed to the next solution.)

For additional assistance, contact Apple Technical Support.

### Startup\*

### Solutions

RAM failure occurs (eight-tone error chord sequence sounds after startup chord)

- 1 Attach power adapter.
- 2 Restart the computer with extensions off (holding down the shift key until you get the "Extensions off" message).
- 3 Verify Apple Telecom software version 2.x or newer is present.
- 4 Check RAM expansion card connection.
- 5 Replace RAM expansion card.
- 6 Replace logic board.

Hardware failure occurs (four-tone error chord sequence sounds after startup chord)

- 1 Check that mylar tape on docking connector is attached and in place.
- 2 Disconnect hard drive cable from logic board and reboot system. If startup sequence is normal, power off system, reseal cable, and retest.
- 3 Check for sound from spinning hard drive.
- 4 Replace hard drive.
- 5 If system is connected to any external device, disconnect device and reboot system. If startup sequence is normal, reseal device's cable and retest.
- 6 Replace logic board.

### Power

### Solutions

Screen is blank; computer does not respond

- 1 Disconnect power adapter, remove battery for 3 minutes, then reinstall battery.
- 2 Press rear power switch.
- 3 Reset power manager.

---

\* Be sure to use Apple Telecom software version 2.x or newer. Express modem software versions 1.2.x or 1.5.x will cause modem and start up problems.

After you remove main battery, some Control Panel settings are different

Power adapter is plugged in, but battery DA does not indicate charger is connected

Computer runs when plugged into wall outlet but not when using battery power; battery voltage is within tolerance

System acts erratically, such as powering off unexpectedly, or hanging up.

System powers down unexpectedly, won't boot off battery, or powers down intermittently when running off battery; battery won't charge

- 4 Try known-good, charged main battery.
- 5 Check all logic board cable connections.
- 6 Replace logic board.

- 1 Make sure backup battery is securely connected.
- 2 Replace backup battery.

- 1 This is normal for fully-charged battery.
- 2 Check power adapter connection.
- 3 Try known-good, charged main battery.
- 4 Check battery contacts on logic board.
- 5 Check output voltage on power adapter to determine if adapter is good.
- 6 Replace logic board.

- 1 If battery is new, fully charge it.
- 2 Check that leftmost CPU stiffener mounting screw is installed.
- 3 Inspect battery contacts on logic board to make sure contacts are not bent or dirty.
- 4 Perform battery contact alignment procedure (see Battery Contact Alignment in "Troubleshooting Procedures").
- 5 If backup battery was dead when you replaced main battery, reset power manager (see Resetting the Power Manager in "Troubleshooting Procedures").
- 6 Replace main battery.
- 7 Replace logic board.

- 1 Make sure logic board mounting screw installed on battery contact is tightened.
- 2 Check power adapter for physical damage.
- 3 Check power adapter connection.

- 1 Make sure battery is good battery.
- 2 Check if battery is securely installed; if it is, battery door will latch correctly.
- 3 Check keyboard cable connection.
- 4 Use Duo battery contact alignment tool to check alignment of battery contacts.
- 5 Replace logic board.

---

## External Floppy Drive

## Solutions

Audio and video present, but external drive does not operate

- 1 Check floppy-adapter-to-PowerBook connection.
- 2 Try known-good floppy disk.
- 3 Check floppy drive cable connection.
- 4 Replace floppy drive cable.
- 5 Replace floppy adapter.
- 6 Replace floppy drive.
- 7 Check that logic board docking connector is protected by mylar covering.
- 8 Replace logic board.

Disk ejects while booting; display shows Mac icon with blinking X

- 1 Try known-good system disk.
- 2 Verify that trackpad button is not stuck.
- 3 Check floppy drive cable connection.
- 4 Replace floppy drive cable.
- 5 Replace floppy adapter.
- 6 Replace floppy drive.
- 7 Replace logic board.

Disk does not eject

- 1 Switch off system and hold trackpad button down while you switch on system.
- 2 Insert straightened paper clip into hole next to drive opening to eject disk.
- 3 Check floppy drive cable connection.
- 4 Replace floppy drive cable.
- 5 Replace floppy adapter.
- 6 Replace floppy drive.
- 7 Replace logic board.

Disk initialization fails

- 1 Try known-good floppy disk.
- 2 Check floppy drive cable connection.
- 3 Replace floppy drive cable.
- 4 Replace floppy adapter.
- 5 Replace floppy drive.

Read/write/copy error

- 1 Try known-good floppy disk.
- 2 Check floppy drive cable connection.
- 3 Replace floppy drive cable.
- 4 Replace floppy adapter.
- 5 Replace floppy drive.

## Video

Partial or full row of pixels is always on or never comes on

## Solutions

- 1 Check cables.
- 2 Replace logic board.
- 3 Replace display.

Display is very light or totally white

- 1 Adjust screen contrast and brightness settings.
- 2 Verify cable, inverter board, and logic board.
- 3 Replace inverter board (CPRC/Int'l only).
- 4 Replace display.
- 5 Replace logic board.

Display stopped working or dimmed but is fine now

If temperature is under 5° C or over 40° C, this reaction is normal.

Backlight doesn't operate

- 1 Verify that backlight cable connection is secure.
- 2 Check cable, inverter board, and logic board connections.
- 3 Verify that cables are not pinched or severed.
- 4 Replace inverter board (CPRC/Int'l only).
- 5 Replace display.
- 6 Replace logic board.

No display, but computer appears to operate correctly

- 1 Press any key to wake computer from system sleep.
- 2 Adjust screen contrast and brightness settings.
- 3 Verify cable, inverter board, trackpad, keyboard, and logic board connections.
- 4 Connect power adapter.
- 5 Replace inverter board (CPRC/Int'l only).
- 6 Replace display.
- 7 Replace logic board.

## Hard Drive

Internal hard drive does not spin

## Solutions

- 1 Check internal hard drive cable connection.
- 2 Replace internal hard drive cable.

Internal hard drive does not power up

- 1 Check internal hard drive cable connection.
- 2 Replace internal hard drive cable.
- 3 Run Mass Storage Test on MacTest Pro.
- 4 Use Drive Setup to reinitialize drive.
- 5 Replace internal hard drive.
- 6 Replace logic board.

---

## Peripherals

## Solutions

Cursor does not move when you are using trackpad

- 1 Reset power manager.
- 2 Check trackpad connections.
- 3 Check keyboard and logic board connections.
- 4 Connect low-power mouse and try to move cursor. If cursor moves, try using trackpad and keyboard. If trackpad does not move cursor, replace trackpad. If keyboard does not move cursor, replace keyboard.
- 5 Replace logic board.

Cursor intermit-tently does not move or moves erratically

- 1 Reset power manager.
- 2 Clean trackpad surface.
- 3 Check trackpad connections.
- 4 Replace trackpad.
- 5 Replace keyboard.
- 6 Replace logic board.

Cursor moves, but clicking trackpad button has no effect

- 1 Reset power manager.
- 2 Clean trackpad connections.
- 3 Check keyboard and logic board connections.
- 4 Examine trackpad button for damage. If OK, reseal and try again. If button still fails, replace it.
- 5 Replace trackpad.
- 6 Replace keyboard.
- 7 Replace logic board.

No response to any key on keyboard

- 1 Verify that computer is on.
- 2 Reset power manager.
- 3 Check keyboard connection.
- 4 Replace keyboard.
- 5 Replace logic board.

Known-good direct connect printer does not print

- 1 Check that power adapter is plugged in.
- 2 Verify that System is 7.5.2 or later.
- 3 Verify that Chooser and Control Panel settings are correct: AppleTalk is off, modem port selected, and external modem selected.
- 4 Check serial cable.
- 5 Replace printer cable.
- 6 Replace logic board.



Known-good network printer does not print	1	Verify that System is 7.5.2 or later.
	2	Verify that the Chooser and Control Panel settings are correct: AppleTalk is on.
	3	Check that Filesharing is turned on and Network Control is not set on Apple Remote Access (ARA) only.
	4	Check cables.
	5	Replace printer cable.
	6	Replace logic board.

Device connected to external modem port does not work	1	Verify that External Modem is selected in CDEV.
	2	Verify that System is 7.5.2 or later.
	3	Verify that modem port is selected in the Control Panels.
	4	Check cables.
	5	Test device with known good computer.
	6	Replace logic board.

I/O devices are unrecognized or garbage is transmitted or received	1	Verify that System is 7.5.2 or later.
	2	Check cables.
	3	Verify that SCSI device is correctly terminated.
	4	Verify that SCSI select switch setting on external device is unique.
	5	Test device with known-good computer.
	6	Replace logic board.

In disk mode, computer does not display SCSI icon until host is booted, or computer crashes when host is shut down	1	Connect computer to a known-good docking device.
	2	Replace logic board.

#### Internal Modem\*

#### Solutions

Internal modem options do not appear in CDEV	1	Verify using system software 7.5.2 or later.
	2	Verify that correct modem driver is present in Extensions folder within System Folder.
	3	Verify that Apple Telecom software v2.x is present.
	4	Remove and reseal modem card.
	5	Replace modem card.
	6	Replace logic board.

\* Be sure to use Apple Telecom software version 2.x or newer. Express modem software versions 1.2.x or 1.5.x will cause modem and start up problems.

Modem does not respond properly to AT command set instructions	1	Verify that baud rate and data format settings of communications application are compatible with internal modem and remote modem.
	2	Check phone cord connection and operation.
	3	Verify using system software 7.5.2 or later.
	4	Remove and reseal modem card.
	5	Replace modem card.
Strange mix of characters appears on screen	1	Verify that baud rate and data format settings of communications application are compatible with internal modem and remote modem.
	2	Check phone cord connection and operation.
	3	Verify using system software 7.5.2 or later.
	4	Verify that Apple Telecom software v2.x is present.
	5	Remove and reseal modem card.
	6	Replace modem card.
	7	Replace logic board.
Modem interferes with system sound	1	Remove and reseal modem card.
	2	Replace modem card.
	3	Replace logic board.
Modem does not respond to incoming call	1	If computer is in sleep mode, verify that "Answer calls" is selected in PowerBook Control Panel.
	2	Verify that Apple Telecom software v2.x is present.
	3	Check phone cord connection and operation.
	4	Replace modem card.
	5	Replace logic board.
Modem has no sound output	1	Verify that Control Panel volume setting is 1 or above.
	2	Replace modem card.
	3	Replace logic board.
Modem connects but does not communicate with remote modem	1	Verify that remote modem needs error correction (error correction is internal modem default).
	2	Type AT &Q0 to disable error correction.
	3	Verify that Apple Telecom software v2.x is present.

---

## Miscellaneous

## Solutions

Application seems to run slower after few seconds

Adjust Battery Conservation Options setting in Control Panel or connect power adapter.

No sound from speaker

- 1 Verify that Control Panel volume setting is 1 or above.
- 2 Check display cable connection.
- 3 Replace display cable.
- 4 Replace speaker (CPRC/Int'l only).
- 5 Replace logic board.
- 6 Return computer to Apple.

Unit unable to come out of sleep mode after asleep for 2 or more days

- 1 Plug in power adapter.
- 2 Press on rear switch power.

Unit unable to enter sleep mode

- 1 Verify using system 7.5.2 or later.
- 2 Make sure display actuator is installed on CPU stiffener.
- 3 Replace sleep switch.
- 4 Replace logic board.

## Upgrades

**▲Caution** The PowerBook Duo contains CMOS devices that are very susceptible to ESD damage. To prevent damage, wear a grounding wriststrap. Review the ESD prevention rules in Chapter 1, Safety.

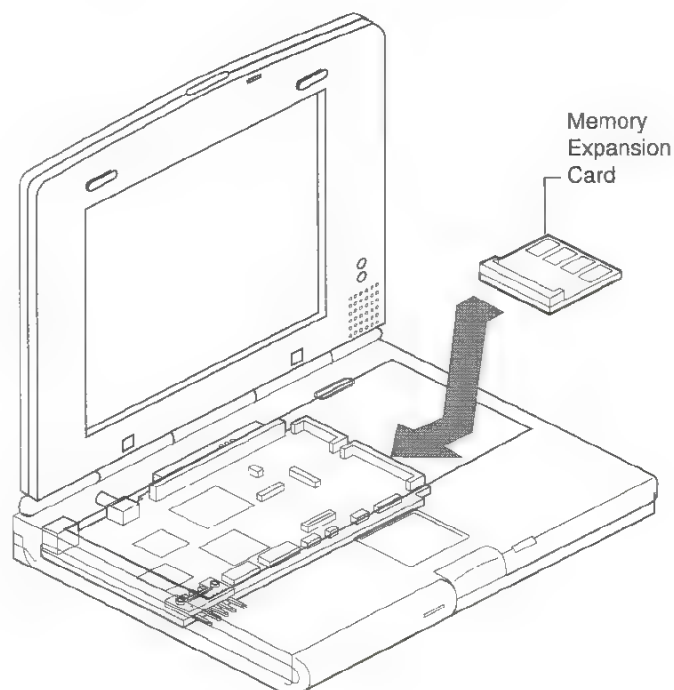
### Memory Expansion

**Note** The PowerBook Duo 2300 is compatible with older PowerBook Duo RAM cards with 85 ns chips.

When upgrading, use 70 ns or faster chips to expand the PowerBook Duo 2300 memory up to as much as 56 MB. To verify that the upgrade is successful, check the Total Memory message (for systems with virtual memory switched off) or the Built-in Memory message (for systems with virtual memory switched on). The memory size should be 8 MB of RAM plus the amount of RAM on the expansion card. If the memory size is incorrect, reseal the RAM card. If the memory size is still incorrect, replace the RAM expansion card. If the memory size is still incorrect, contact Apple Technical Support.

To install a RAM expansion card,

1. Remove the power adapter, main battery, and keyboard.
2. Holding the RAM expansion card by the edges, slide it into the unit.
3. Connect the card to the logic board (see Figure 66).



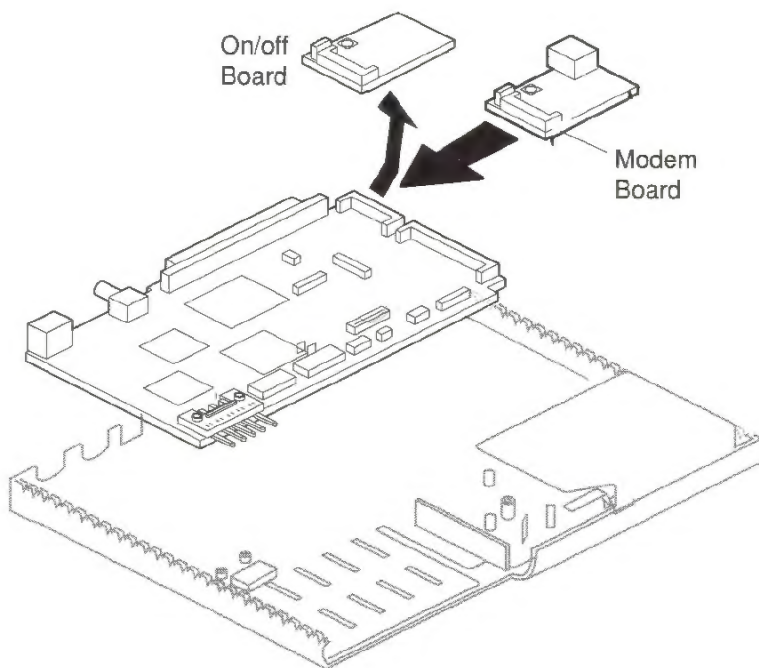
**Figure 66. Memory Expansion**

## Modem

The Apple modem includes the on/off circuitry provided by the on/off board. After installing the modem board, you may discard the on/off board.

To install a modem card:

1. Remove the power adapter, main battery, keyboard, end clutch covers, top case, hard drive, backup battery, display assembly, and CPU stiffener.
2. Remove the modem cap from the rear cover.
3. Disconnect the on/off board.
4. Holding the modem board (see Figure 67) by the edges, connect it to the logic board.



**Figure 67. Modem Expansion**





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